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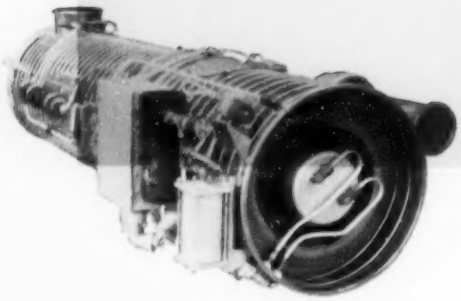

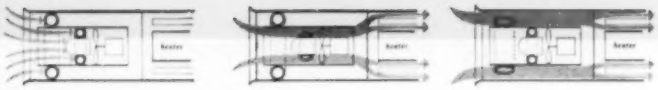

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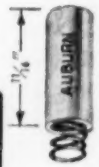

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Aviation Week

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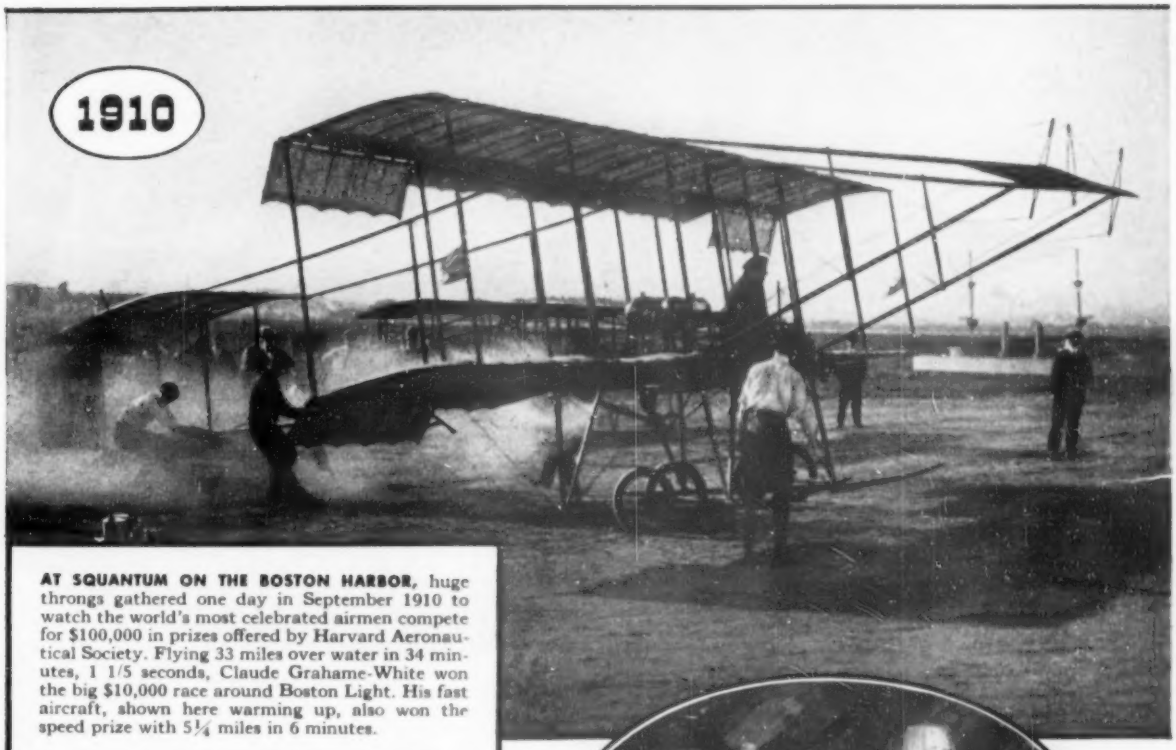
WARMING UP FOR THE BIG RACE -



AT SQUANTUM ON THE BOSTON HARBOR, huge throngs gathered one day in September 1910 to watch the world's most celebrated airmen compete for $100,000 in prizes offered by Harvard Aeronautical Society. Flying 33 miles over water in 34 minutes, 1 1/5 seconds, Claude Grahame-White won the big $10,000 race around Boston Light. His fast aircraft, shown here warming up, also won the speed prize with 5¼ miles in 6 minutes.

Dramatic contrast to those early days of flight is this F-86D, latest version of the North American Sabre Jet, now in production. It is rated in the nearly 700 MPH class. Sister models of the 'D' have played a vital role in the air war over Korea, having accounted for a great number of the Red MIG's shot down.

● Superiority of the Sabre can be attributed, in part, to new features such as the "brain box"—a new development introduced on the F-86D model. Among other things, the "brain box" automatically controls the flow of fuel through the engine to bring about the best possible performance.

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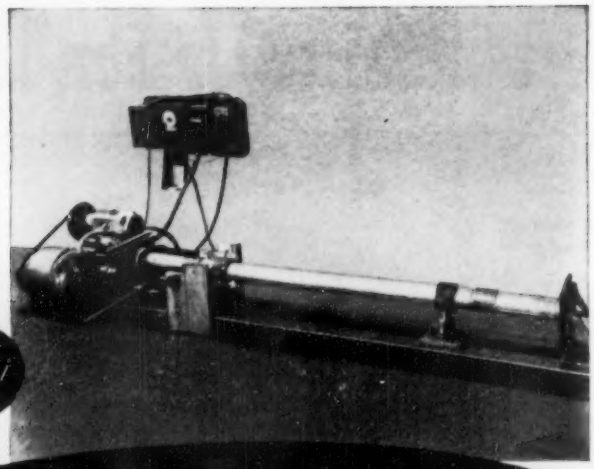

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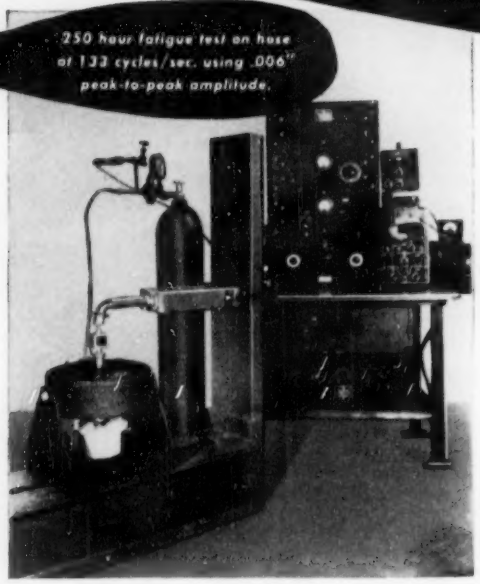

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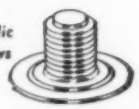


Metallic bellows

NEWS DIGEST

NEW S.O. 4050 VAUTOUR twin-jet night fighter and ground-support plane displays interesting characteristics in this first photo of actual plane (model was shown in Aviation Week, Nov. 3, p. 15). Note the dual tandem-2X wheel main landing gear and smaller outriggers, which fold into engine nacelles. Prototype's powerplants are 6,000-lb. Atar 101Bs.

Domestic

Robot pilot flew a Lockheed QF-80 jet drone through a radioactive cloud set off by an atomic explosion last week at Nevada proving grounds. Developed by Sperry Gyroscope Co., the robot system pilots the drone by radio and radar signals sent from two ground stations or from a nearby director aircraft.

First synthetic lubricant for jet engines approved under U. S. military specifications has been developed by Standard Oil Development Co., an affiliate of Standard Oil (New Jersey). Known as Esso Aviation Turbo Oil 15, the new lubricant is being used in the Pratt & Whitney J57, and is the only oil approved so far for Curtiss-Wright's J65 Sapphire. A parallel development (EATO35) was carried out in Great Britain by the Esso Development Co., Ltd.

Merger of Temco Aircraft Corp. and its subsidiary, Luscombe Airplane Corp., was approved this month by stockholders of the two firms.

A $7-million contract was awarded Lockheed Aircraft Corp. last week by Varig, pioneer Brazilian airline, for purchase of three Turbo-Compound Super Constellations.

Atomic submarine thermal reactor prototype plant is in its first phase of operation in tests that could aid in developing reactors for nuclear-powered aircraft engines.

Accident-free flight operation for more than a year was completed recently by Military Air Transport Service's Pacific Division, carrying an estimated 235,000 passengers and 35,000 tons of cargo and mail in a period of 115,000 flying hours.

First aircraft maintenance check system to be designated as standard for Air Force and Navy has been adopted for the inspection of DC-6 military transports.

Six-engine Convair XC-99, double-deck cargo transport, has flown 2,000 hr. in Air Force operation, carrying freight at a reported cost of 11 cents a ton-mile.

Mohawk Airlines and the Air Navigation Development Board have confirmed an AVIATION WEEK report (Jan. 26 p. 10) that the carrier will be the first airline equipped with fleetwide installation of distance measuring equipment (DME), loaned to Mohawk by ANDB.

Three-man crew of a California Eastern Airways cargo DC-4 ditched in the Pacific recently after two engines failed. All aboard escaped in life rafts.

Civil aircraft shipments totaled 365 planes valued at $17.7 million last January, compared to 254 airplanes valued at $16.7 million during the preceding month, CAA reports. Engine shipments totaled 583, a 12% increase over December.

Lockheed Aircraft Corp. established a "Lockheed Leadership Fund" this month to finance 20 four-year college scholarships for study in airplane engineering and manufacture.

Export sales of civil aircraft last February totaled 28 planes valued at $334,237, nearly double the $173,337 value of 24 units exported during the preceding month, according to AIA.

Navy's 250th sweptwing jet Cougar was tested recently by Grumman Aircraft Engineering Corp., Bethpage, N. Y.

Financial

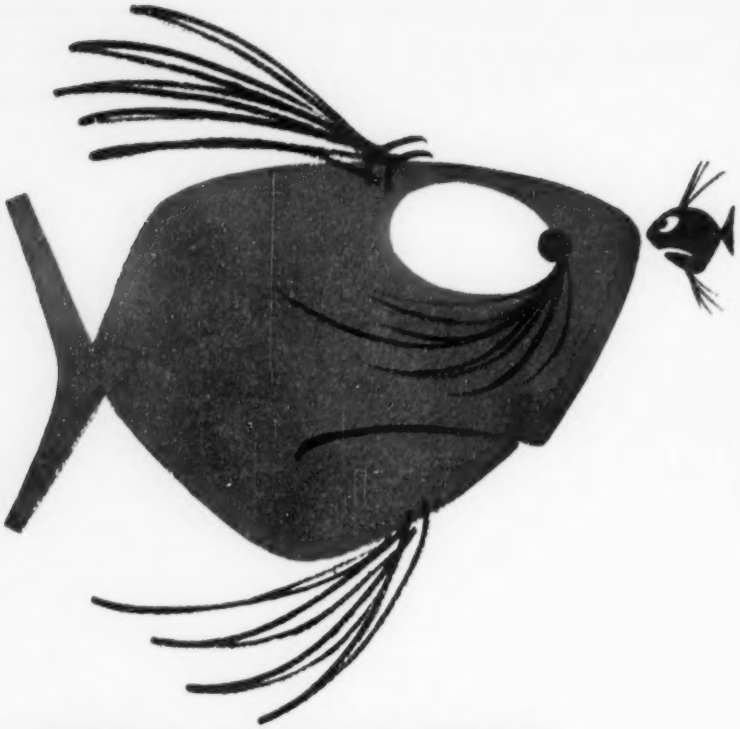
Northwest Airlines earned a net income after taxes of $1,789,337 last year from revenues totaling $61,552,380; 1951 net income was $1,785,671 from revenues of $6,867,320.

Capital Airlines reports a $3,016,081 total for February operating revenues, highest for that month in the carrier's 26-year history.

International

Sabena Belgian Airlines has taken delivery of its second 77-seat Douglas DC-6B. By May 10, the carrier is scheduled to receive six of eight DC-6Bs on order, enabling Sabena to increase New York-Brussels flights to nine trips a week and permitting a 75% boost in trans-Atlantic seat capacity over last year.

Four Convair-Liner 340s have been ordered by Real Transportes Aereos for operation over the Brazilian airline's domestic routes and to Uruguay and Paraguay.



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Washington Roundup

Peace and Economy

Two late developments indicate the Administration is going to come forth with a thoroughly rehashed defense program cutting deeper into the $41-billion Truman-proposed fiscal 1954 budget than the $4 billion contemplated only a few weeks back:

Stock is being placed on Russia's peace offensive in calculating defense requirements. This doesn't mean the Administration has thoughts of scotching defense and arming for an era of peace. In fact, spokesmen such as Armed Services Committee chairman Sen. Leverett Saltonstall are cautioning on the need to keep up a strong defense position. But, points such as these are being made:

- That Russia's peace approach, supported by more than words, probably takes some of the urgency out of the defense program.
- That an end to a shooting war in Korea automatically cuts the defense requirement by eliminating battle losses.
- That these two factors point to a switch in defense emphasis, such as, for example, more emphasis on guided missile research and less on hand grenades.

Secretary of Defense Charles Wilson plans to cut out the extra costs of keeping up a broad industrial base and aim, instead, at getting end items as efficiently and economically as possible. Whether it meets with Presidential approval, this position is likely to draw substantial support in Congress. Sen. Styles Bridges, chairman of the Appropriations Committee and an Armed Services subcommittee on aircraft procurement, plans to go into the question of opening second and third production sources.

Defense and Politics

Defense is tinted with politics, both domestic and international, up on Capitol Hill.

- Sen. Saltonstall raised the following point on speeches by Democratic spokesmen–Sen. Lyndon Johnson and Sen. Stuart Symington–questioning the adequacy of defense: If there is any inadequacy, it isn't due to the Eisenhower Administration.

He commented in a letter, made public, querying the President on the status of defense: "I do not feel that the situation has deteriorated during the past few months to a degree which calls for some special apprehension not previously warranted. . . ."

- Minority Leader Johnson, in a public speech, modified his tack: praise for the status of defense and warning against a letdown.

A few weeks back, Johnson put forth such rousing questions as: "Does an aggressor nation have the planes and the weapons with which the United States can be attacked at any and every point? Do we have a force that could deliver devastating counterblows against an enemy or have we placed our faith in equipment that is obsolete?"

Last week, he appeared to have the answer, when he told an audience: "We must not lightly cast away the gains we have been making in the creation of a national defense program so far-reaching that no tyranny will willingly take steps to plunge the world into war." He added: "We must not let down. We must make certain that we do not let these most recent Communist moves cause us to fold up our military strength."

Johnson's switch from offensive to defensive on military mobilization is a sign of the trend to relax. Too, talk of "devastating counterblows" would be an unpolitic reply to peace steps.

President Takes Control

President Eisenhower, with the advice of an actively functioning National Security Council, has taken a firm hold on the defense program. Indications:

- The President flatly stated to a news conference that he–and not Pentagon chiefs–would determine the level of combat forces. He would not delegate the authority, he said.
- He pointed to his personal interest in a letter to Sen. Saltonstall: "It is accurate for me to say that the problems of the nation's security have been my paramount concern during the first two months of this Administration."
- The President pointed to the Security Council, not Defense Department, in reply to Saltonstall's expression of concern over the status of defense:

"One of my early concerns was to devise means to improve and strengthen the operations of the National Security Council. . . .

"Since my inauguration, the council has worked steadily and intensively. One to two meetings per week are the rule. . . . You will see from this schedule that we are devoting concentrated attention to security questions.

"In addition to studying the status of the nation's security program as reported at the end of 1952, the council has been appraising the cost of the security programs, the impact of that cost on the nation's economy, and the value obtained for the money expended, in terms of the current year and of subsequent years. . . ."

- The President made only one tailend mention of Defense Department in his reply: "You are also aware of the study now in progress in the Defense Department on the organizational phases of the problem affecting that department." But the President made it clear that he and the council would "evaluate" the necessity for "fundamental" organizational changes, as well as "calculated risks" to be taken in the defense program.

This marks a change from the Truman Administration: Over the past few years, Pentagon has thrashed out its own program, without an overall ceiling when the Korean war was hot and with a ceiling when it lulled; White House generally kept "hands off"; and, Budget Bureau served as little more than a second check on defense budget items.

A likely result of the new top role for National Security Council: The defense program will be tailored to fit the economy, instead of vice versa. Non-military interests overwhelmingly dominate.

- Secretary of Defense is the only member whose prime concern is U. S. armed strength. Others, who will now have a strengthened voice in defense matters: Vice President, Secretary of State, Secretary of Treasury, Director of Mutual Security and Director of Defense Mobilization.
- Only military participant will be the Chairman of the Joint Chiefs of Staff, who will attend as an adviser.
- Further diluting the voice of the military, teams of presidentially appointed civilians periodically will serve as consultants to the council. The first team, which just completed three weeks' consultant service, included a utility executive, a chemical company executive, a newspaper publisher, a labor leader, a university president.

–Katherine Johnsen

INDUSTRY OBSERVER

► Republic Aviation's F-84F Thunderstreak is currently redlined at Mach 1.18. Tachometer is redlined at from 5,000 to 7,250 rpm. and again at around 10,000 rpm. Normal cruise for the British Sapphire is 8,600 rpm., normal cruise for the Wright J65 version of the Sapphire is 8,000.

► Beech Aircraft has a project to fit its T-36A trainer with turbojet engines. This version would be known as the T-36X.

► Navy has confirmed Aviation Week's prediction (Apr. 6, p. 11) that the Grumman F10F Jaguar production program would be eliminated and only a dozen service test models built. Some of the reported difficulties in the aerodynamically balanced "platypus" T-tail on the Jaguar are expected to be solved by switching to a conventional horizontal tail.

► CAA is preparing a flight test program with a Hydro-Aire automatic nonskid braking device on one of its DC-4s at Oklahoma City flight test center. Northwest Airlines is operating the device on its Boeing Stratocruisers.

► De Havilland is studying a modification of the wing air intakes for the Comet's Ghost turbojets to provide more air during takeoff when the wing is at a high angle of attack. Comet operations to date indicate the high angle of the wing screens part of the inlet during takeoff and reduces air flow to the engine.

► Douglas Aircraft's new Navy attack bomber design—the XA4D—is scheduled to be powered by advanced versions of the Wright J65 Sapphire slated to deliver approximately 8,000 lb. static thrust.

► Douglas Aircraft's new turboprop-powered transport, the C-124X, is to be powered by advanced versions of the Pratt & Whitney T34 single-unit turboprops that probably will be rated at 6,000 eshp. The C-124X will have a completely pressurized fuselage to enable its use as a personnel transport in addition to cargo work at the high altitudes where turboprops are most efficient. The YC-124B to be powered by earlier T34 turboprops will have only a pressurized cockpit and will be used only for cargo or aerial tanker operations.

► Grumman's XS2F-1 anti-submarine warfare plane has excited interest among feederline operators for possible modification into a transport to replace the DC-3. Biggest problem would involve fuselage modification to get the 28-passenger capacity sought by feeders. Don Nyrop, former CAB chairman and now Washington representative of local service airlines, will discuss the possibilities with Grumman.

► International aviation circles are talking about ICAO Working Paper No. 144, which analyzes 50 million hours of aircraft engine operations and contains a theory of direct relationship between engine complexity and frequency of inflight propeller feathering, indicating engine failures in flight. The analysis taps the Pratt & Whitney R1830 engine (DC-3) as the most reliable, with a frequency of one feathering every 24,000 hr. of engine operation, as compared to P&WA's R4360 engine with one feathering every 1,200 engine hours.

► One little-known difference between the British and CAA over jet transport certification is that the British want a speed only 15% higher for the V-2 condition of flight, than for the V-1 takeoff condition, while CAA is holding out for a 20% stepup from V-1 to V-2.

► United will modify all its 66-seat, five-exit, three-abreast-seating DC-4 aircoaches to seven-exit, two-abreast, 64-seat configuration by December. This is the final compromise settlement between CAB and the airline, first reported in Aviation Week Mar. 2, p. 37. United president W. A. Patterson, after seeing militarily classified NACA crash-fire movies, last November defied CAB minimum economic coach-fare seating requirements by cutting his coaches back to 54 passengers.

WHO'S WHERE

In the Front Office

Thomas A. Murphy has been appointed vice president-special assignments of Republic Aviation Corp., Farmingdale, N. Y. He has been succeeded as works manager by **D. K. Tasker.**

John David Wright is the new president of Thompson Products, Inc., Cleveland, succeeding **Frederick C. Crawford,** who has been elected chairman of the board.

C. Hart Miller resigned this month as executive vice president and general manager of Piasecki Helicopter Corp., Morton, Pa.

Willis Player has been named vice president-public relations of Northwest Airlines.

Jack G. Allen has been appointed a vice president of Bingham-Herbrand Corp., Fremont, Ohio.

Delta-C&S Officers

C. E. Woolman will be president of the merged Delta and Chicago & Southern Air Lines and **Carleton E. Putnam** will be chairman of the board of directors after the two carriers are consolidated about May 1.

Other officers of the combined companies will be: **Sidney A. Stewart,** executive vice president; **Charles H. Dolson,** vice president-operations; **Laigh C. Parker,** vice president-traffic and sales; **Thomas M. Miller,** assistant vice president-traffic and sales; **Junius Cooper,** vice president-finance; **Todd G. Cole,** vice president-comptroller; **Richard Maurer,** vice president-legal; **Robert H. Wharton,** assistant to the president, and **W. T. Beebe,** personnel director.

Changes

Bert J. McNamara has been promoted to purchasing manager of Pratt & Whitney Aircraft, East Hartford, Conn. **C. E. Holtsinger** is P&WA's new assistant to the general manager, and **Donald L. Brown** is licensee liaison engineer.

Arthur I. Lusk, former director of Northrop Aircraft guided missile development, has been appointed chief engineer of Rosan, Inc., and Rosan Engineering Co., Newport Beach, Calif. **Robert D. Weber** has been named director of engineering for the two companies.

Robert W. Lake has been promoted to director of sales for Seaboard and Western Airlines.

William R. Walker is Jack & Heintz' new Washington, D. C., district manager.

Joseph M. Lubin has joined the Air Transport Assn. as a public information officer.

Paul Forsythe and **John Morris** have been named engineering directors of Western Gear Works, Lynwood, Calif.

Max Van Baaren has been appointed purchasing agent of Mohawk Airlines.

F. G. Lundgard has been promoted to service manager of the Aircraft Hydraulic Division, Sundstrand Machine Tool Co., Rockford, Ill.

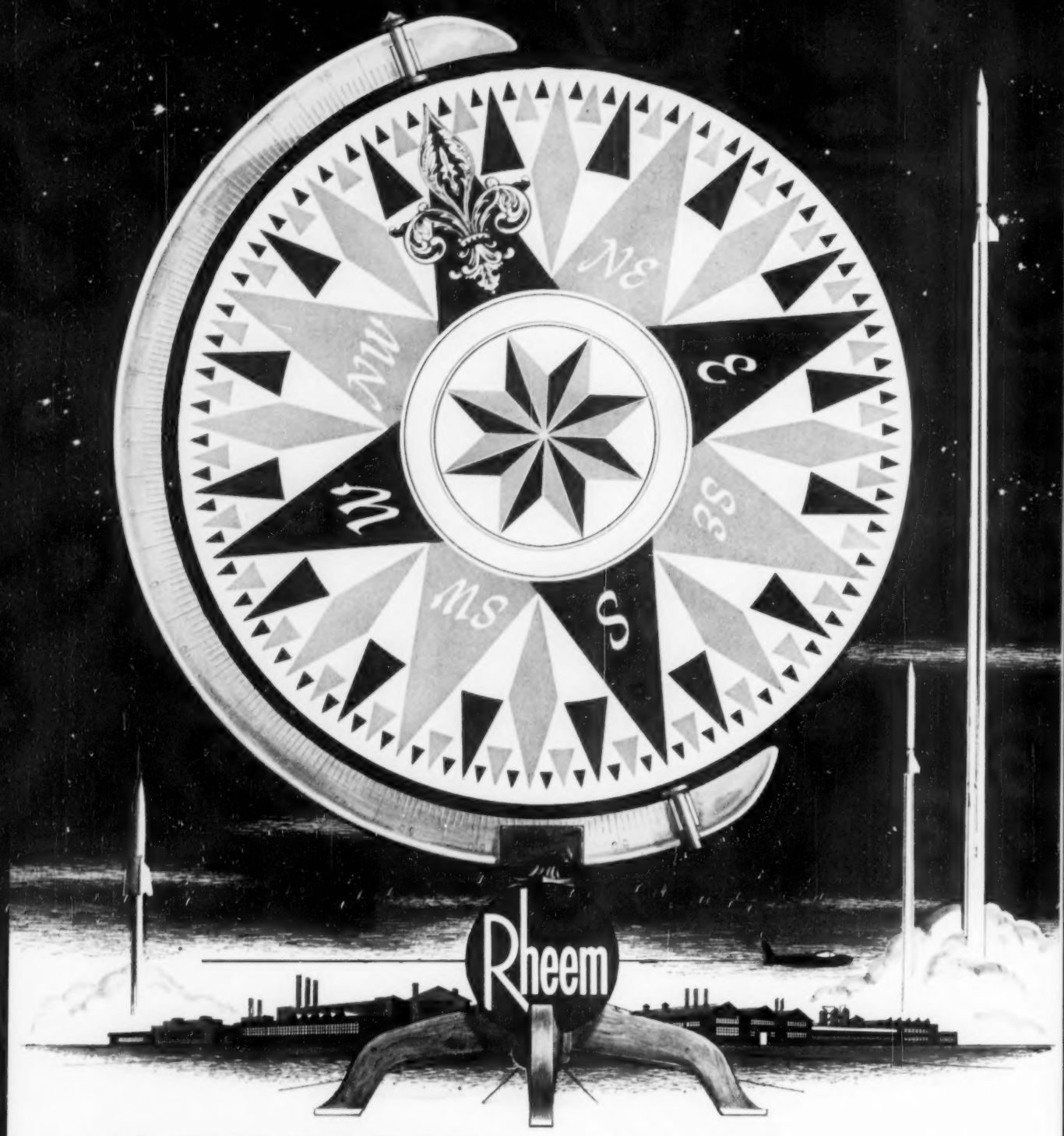
CUTLASS ABOARD A CARRIER AT SEA

"Coming Topside"

The Navy's new swept-wing, twin-jet F7U-3 fighter, designed to be a top performance member of America's Air Power team, comes up on the deck-edge elevator to the flight deck for carrier evaluation trials.

Chance Vought Aircraft DALLAS, TEXAS

ONE OF THE FOUR DIVISIONS OF UNITED AIRCRAFT CORPORATION



American progress in aviation is respected wherever the compass points

America's achievements in the world of aeronautics have built an enviable reputation that reaches to the four corners of the earth.

A prime factor in building this global reputation has been persistent research for better materials . . . better fabrication . . . and better production methods.

To Progress through Research is a constant in Rheem development and manufacturing. Our facilities are available.

RHEEM—Aircraft Division, Downey, California . . . Research and Development, Whittier, California

AVIATION WEEK

VOL. 58, NO. 15

APRIL 13, 1953

Pentagon in Uproar, Warns . . .

New Air Power Plan Would Scuttle SAC

- **Administration favors fighters over bombers.**
- **Also wants cut back on second-source output.**

The Pentagon seethed last week with basic conflicts over the future of military aircraft production.

Defense Secretary Charles E. Wilson, storm center of the current military debate, attempted to lower an iron curtain of secrecy over the Pentagon. But despite threats of courts martial for military officials making "unauthorized disclosures," news of the following major battles seeped out of the Pentagon:

• **Conflict between Wilson and the Air Force** over future USAF policy. Wilson would like to slash jet bomber production heavily and concentrate on fighters and defensive missiles to bolster air defense of North America against threat of Russian atomic attacks. USAF is bitterly resisting what it terms "a Maginot Line" concept of air defense and warns that neglect of its jet bomber striking force would be courting national disaster.

• **Conflict of Wilson's** Detroit automobile manufacturing philosophy of defense production and the industrial mobilization program backed by the Air Force, Navy and aircraft industry. Wilson wants to reverse the industrial mobilization policies established during the Defense Department regimes of George Marshall and Robert Lovett in favor of narrowing the military industrial base, eliminating licensee and second-source production, and scrapping standby plants and reserve tooling. Wilson wants primary mobilization reliance on quick conversion of civilian plants to military products.

Military and aircraft industry production experts point out that this "Detroit philosophy" was proved fallacious by the bitter experience of World War II and the present Korean emergency when it took at least two years to convert auto plants to military products or establish new military production facilities.

• **Conflict between** the Republican economy bloc in Congress that favors immediate drastic defense slashes based on the current Russian "peace" offensive and a combination of bipartisan congressional leaders and military brass opposed to major reductions in military production and armed strength. This combination believes current Russian policy is aimed at stimulating a critical reduction in the U. S. defense effort.

▶ **Capitol View**—Washington reaction to portions of the defense debate leaking across the Potomac ranged from opinions that "Wilson is a worse Defense Secretary than Louis Johnson" to a feeling that the Republican regime eventually will emerge with a militarily sound and economically feasible defense program.

RECENT VISITS such as this to Boeing-Wichita B-47 Stratojet plant by Defense Secretary Charles E. Wilson (center, dark suit), USAF Secretary Harold E. Talbott (right) and USAF Vice Chief of Staff Gen. Nathan F. Twining (extreme left) preceded disclosures of Administration plans to make heavy cuts in bomber program.

Some observers believe that the Wilson regime is out to make an impressive fiscal 1954 budget showing on Capitol Hill regardless of the real effect on the armed forces or an actual waste of funds in programs already too far advanced to offer a chance for real economy. Other observers believe the Pentagon budget pruning is a selective, orderly process proceeding along the broad lines of the Campbell Report (AVIATION WEEK July 28, p. 12).

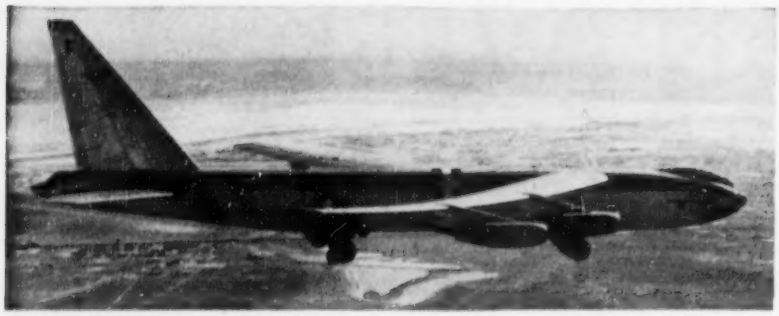
Although USAF Secretary Harold Talbott has made no public statement on his views in the current debate, indications are that he is backing Wilson's position against that of USAF military leadership.

Talbott recently conferred with Strategic Air Command boss General Curtis Lemay at Omaha and Air Materiel Command brass at Dayton on the proposed cuts in jet bomber production. He also visited key SAC bases at Carswell AFB, Texas, where the bulk of the B-36 atomic bombers are kept and McDill AFB, Fla., where the first B-47 wings are operating.

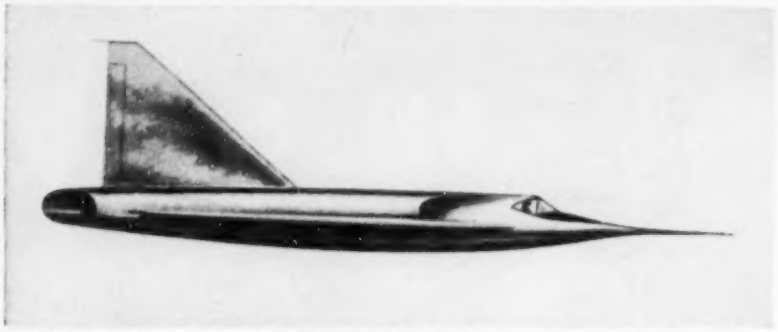
Lieut. Gen. Orval Cook, Deputy

MiG-15 Scoop

A trained observer who saw the first intact MiG-15 to reach Allied hands in Western Europe has sketched its important features for AVIATION WEEK readers. Turn to pages 17, 18 and 19 for description and drawings.



JET BOMBERS, like heavy B-52 (above) and medium B-47, may relinquish spotlight to . . .



SPEEDY INTERCEPTORS, like Convair F-102 (artist's conception) under Wilson plan.

Chief of Staff for Procurement, and the newly appointed Assistant Air Secretary for Materiel Roger Lewis were in Dayton last week reviewing USAF's production acceleration insurance program and other targets of Wilson's production views.

▶ **Special Mission**—USAF hastily canceled its budget presentation to Defense Undersecretary Roger Kyes and other key men on Wilson's staff last week. Instead Kyes and USAF Undersecretary James Douglas flew to SAC Headquarters in Omaha for special briefing by General LeMay on the jet bomber program. The Kyes-Douglas mission was interpreted as another effort by USAF to convince the Wilson regime that the jet bomber program is a vital part of the U.S. defense program.

Origin of Wilson's opposition to the USAF jet bomber program is not clear, but ironically it seems to stem at least partially from the Project Lincoln report, an air defense study done by Massachusetts Institute of Technology under USAF contract (AVIATION WEEK Mar. 23, p. 15).

Some observers believe his views also are influenced by the fact fighter aircraft are much less expensive than multi-jet bombers and a better superficial showing of economy can be made by eliminating expensive bomber programs.

If the ruling against USAF's jet bomber program stands, it probably will involve eliminating the B-47 programs now underway at Lockheed's Marietta plant and the Douglas Tulsa Division. Total B-47 program would be cut by about 400 planes. Remaining B-47 production would be concentrated at Boeing's Wichita Division. A huge network of subcontractors enlisted to support the Marietta and Tulsa programs would also be eliminated under the proposed program.

▶ **Recalls Woodring Decision**—Boeing's B-52 Stratofort program also would be reduced to little more than a service test quantity (probably fewer than 20 aircraft) from the major B-52 production program now scheduled for the Seattle plant.

Although Wilson's primary interest in air defense may result from the lower unit cost of fighter aircraft, the Project Lincoln study estimated the cost of an adequate continental U.S. air defense at between $16 and $20 billion.

Military observers also recalled a similar decision by Secretary of War Harry Woodring in the mid-Thirties that ordered the then Army Air Corps to buy cheaper fighters, trainers, light bombers rather than more expensive Boeing B-17 Flying Fortresses. This decision was credited with retarding the B-17 development program by several years in the critical period just before World War II.

Wilson outlined his industrial mobilization philosophy in a supposedly "off the record" luncheon for Pentagon reporters that quickly became a matter of record. His views are based on the idea that a relatively small aircraft industry operating at high production rates is more efficient than a larger industry composed of second sources and licensees producing at lower rates.

Pentagon planners don't question that Wilson's plan is a more economical way to meet current production requirements but they point out that two national emergencies have proved that it is not the answer to meet the problems posed by a major war or military struggle for survival.

▶ **Dim Spots**—Wilson's plan to meet a full-scale emergency is based on the quick conversion of automotive facilities to war production. But Pentagon planners point out that it has been nearly three years since the first automobile makers had begun to build aircraft engines under license from the aircraft industry and that these automobile licensees were still one of the dim spots in the current production picture.

Wilson also proposes to reverse the Marshall-Lovett policy against accumulating stockpiles of weapons with a fast rate of obsolescence. The Marshall-Lovett policy favored creating production capacity rather than weapons stockpiles. Wilson proposes to solve wartime mobilization problems by stockpiling tanks, aircraft and other equipment the way surplus World War II equipment was kept in storage during the pre-Korean years. Again Pentagon military planners point out that, however economically attractive this policy might be, it is extremely dangerous militarily since it would commit our armed forces to using obsolete equipment.

If the Wilson philosophy prevails, the following production programs now scheduled for a second source will be restricted to the primary manufacturer:

• **Convair F-102** all-weather supersonic interceptor.

• **McDonnell F-101** long-range penetration fighter.

• **Beech T-36A** trainer. Canadair already has been designated a second source on this program.

The current aircraft engine production picture is clouded by a combination of Wilson's second-source philosophy, major revision of jet engine spares requirements, and the lagging production of automobile licensees. For one reason or another, the following engine programs are slated for reductions in addition to the General Electric J47-25 program (AVIATION WEEK Apr. 6, p. 15):

• **Wright R3350 Turbo-Compound engine.** Licensee Chevrolet at Tonawanda, N. Y., will take the brunt of this reduction.

• **Wright J65 Sapphire turbojet.** Licensee Buick's program will be curtailed.

• **Westinghouse J40 turbojet.** Licensee Ford's Lincoln-Mercury Division will be dealt out of the program and Westing-

house's own production schedule has been reduced and stretched out.

• **General Electric J73 turbojet.** Major cutback on this engine is primarily the result of reduced spares requirements.

The battle on Capitol Hill over whether the current Russian peace offensive warrants a major defense reduction will be fought in a glare of publicity unlike the infighting now going on behind the Pentagon curtain of secrecy.

The Republican economy bloc can be expected to press for a defense cut of up to $8 billion. Opposition by both Democrats and Republicans will be based on skepticism as to the real meaning of the Russian moves and the advantage of hindsight—recalling the congressional panic of the fall of 1950 when drastic cuts in defense spending were demanded in October just after the successful United Nations' landings at Inchon and offensive that reached the Yalu River, and the congressional panic of December when the Chinese Communists attacked in full force and Congress was willing to give the Pentagon a blank check.

Congressional leaders such as Sen. Leverett Saltonstall, a Republican, and Sens. Lyndon Johnson and W. Stuart Symington, Democrats, are warning that an adequate defense production program and national military posture cannot be maintained without adequate long-term military planning and sticking to those plans.

CAA Budget Faces $60-Million Slash

The Republican Administration wants the Democrat-proposed budget of $200 million for Civil Aeronautics Administration for the coming 1954 fiscal year reduced by almost $60 million to $140.9 million. This would cut CAA below its current operation on a $149-million budget appropriated for fiscal 1953.

The reduction would be accomplished by elimination of new airport construction and air navigation facilities, a sharp cut in air navigation development, and moderate cuts down the line.

It would involve dismissal of 391 CAA employes. Employment in the current year is 17,275. Under the Eisenhower budget, this would go down to 16,884. Under the Truman-proposed budget, employment would climb to 17,833.

Breakdown of the $140,947,000 CAA appropriation recommended by the new Administration:

• Airport construction, $22,700,000 to liquidate contracts already signed. Truman budget recommended $30,200,000 for contract liquidation, plus $30,000,000 matching funds for new projects.

• Establishment of air navigation facilities, $7,000,000 to liquidate contracts. Democratic budget proposed an equal amount plus $13,000,000 for new facilities.

• Air navigation development, $1,750,000. Budget had recommended $4,000,000.

• Salaries and expenses, $105,500,000. Budget called for $110,300,000.

CAA Orders Fix On H-S Prop Assembly

Another in a series of inadvertent propeller reversals troubling the transport industry was reported by the pilot of an Air Force Fairchild C-119 Packet at Greenville, S. C.

As a result of the incident, Civil Aeronautics Administration has issued an airworthiness directive for those Hamilton Standard reverse-pitch propellers incorporating low-pitch stop assemblies which have wedge return spring. These are used on the following planes: Boeing 377, Convair 240 and 340, Douglas DC-6 series, Lockheed Constellation series, and Martin 2-0-2 and 4-0-4. Equipment includes propeller models 23260, 24260, 43E60, 34D51, 34D50.

The directive states that the inadvertent reversal occurred while the Packet was making an approach at Greenville Airport Mar. 19 and was caused by "improper seating of the wedge on the low-pitch stop-levers." This resulted from "an accumulation of tolerances in the low-pitch stop assembly."

► **The Directive**—An inspection of the assemblies is directed at the earliest opportunity, not later than the next scheduled periodic inspection or overhaul and not later than Apr. 30.

Rework is ordered if the inspection fails to show a slight but free movement of each stop-lever around its hinge.

If the inspection discloses any perceptible movement of the wedge spring under hand pressure and/or bounce-back of the levers when pressure is gradually reduced, replacement of the stop assembly is directed.

At the next scheduled overhaul or prior to installation in propeller assemblies, reworking of all low-pitch stop-levers is directed. This is accomplished by grinding back the cusp from the wedge contact surface of the lever with a portable grinder or internal grinding machine, and following drawings in Hamilton Standard Service Bulletin 249 issued Mar. 26.

65% Cut in NACA Construction Funds

The Eisenhower Administration wants $10 million cut from the $14.6 million recommended in the Truman budget for construction of new National Advisory Committee for Aeronautics facilities in fiscal 1954.

The two-thirds reduction would be accomplished by eliminating:

• **A rocket engine research facility** at the Lewis Laboratory, $8,514,190.

• **Variable Mach number nozzle** for a 4x4-ft. supersonic tunnel at Langley Laboratory, $1,370,700.

• **Test section alteration** of supersonic free-flight tunnel at the Ames Laboratory, $179,000.

The new Administration also asks reduction of the Truman budget of $58,830,000 for NACA salaries and expenses over the coming fiscal year to $53 million. This would still allow NACA to hire 230 more employes. Current NACA employment level is 7,220. It would total 7,450 under the Eisenhower budget (under Truman's, 8,200).

NEW ITALIAN COPTER TESTED

Initial flight trials have been made at Urbe Airport of this two-place co-axial helicopter built by Count Ettore Manzolini and named the Dragonfly. Engine is a 105-hp. air-cooled type utilizing exhaust ejector to aid cooling. Gross weight of the Dragonfly is 1,430 lb. Top speed is approximately 75 mph. Rotor diameter is 26 ft.

Record Postwar Backlogs Listed

Grumman and Bell also report new highs in 1952 total sales, predict greater peaks this year.

Two major aircraft manufacturers, holding a current total backlog of more than $1.1 billion, reported record postwar sales for 1952.

Combined sales of the two firms amounted to $350 million last year and resulted in total net earnings of more than $7.2 million. One company, Grumman Aircraft Engineering Corp., reported net earnings decreased 2.43%.

Optimism was expressed that 1953 sales would continue at record levels.

The companies:

Grumman Aircraft

Reporting record postwar gross sales of $220,547,193, Grumman Aircraft Engineering Corp. said net earnings decreased last year because of federal taxes that cut profits to below the reasonable-return level.

Net earnings totaled $5,348,900, 2.43% of sales and less than 1951 earnings of $5,456,246. Gross sales climbed approximately 32% higher than the preceding year's $167,581,568 total.

Backlog of unfilled orders was estimated at $273,225,000 plus $465 million in letters of intent.

▶**Tax Trend**—Leroy R. Grumman, chairman of the board of directors, warned that the U.S. aviation industry is losing independence, strength and design leadership because of "being unable to retain a reasonable profit on sales.

"A trend toward foreign designs of both engines and aircraft is evident," he said.

Grumman said increased labor and material costs contributed to the corporation's decreased earnings, but he attacked the excess profits tax as responsible for the bulk reduction.

"Forced to expand by the defense program, aircraft companies are particularly hard hit by this tax," the board chairman said. "More working capital is required to carry on the expanded business. More capital is also required for modernization of plant facilities. Because of the advent of jet aircraft, our airports and certain manufacturing equipment are rapidly becoming obsolete. Funds for capital purposes cannot be retained for use in business, even in a year of very high sales, because of excess profits taxes.

"It has been necessary to finance with government funds the new and modernized facilities we need to continue in business. As a result, a larger percentage of our plant is becoming government-owned."

▶**Outlook**—Grumman predicted a production volume this year slightly larger than 1952's total, but he noted that defense spending is reaching a leveling-off point and that defense contracts are subject to review, revision and cancelation.

In 1952, more than 99% of Grumman's business was defense work, he reported.

▶**Production**—The new twin-engine S2F-1, designed for the Navy as a successor to "hunter-killer" Guardian, is projected for production as an anti-submarine aircraft and in utility versions.

Grumman's guided missile project is described as a "long-range project and one that promises little hope for production work . . . in the near future." But "tests to date indicate the ultimate success and practicability of the guided missile as a future weapon," Grumman said.

Production contract for the Grumman XF10F, carrier-based jet fighter, was cut back this month to approximately 14 aircraft for experimental and in-service tests.

Basic production at Grumman:

• **Fighters.** Output of fighters this year will consist entirely of the F9F-6 and F9F-7, sweptwing successor to the carrier-based F9F-5 Panther.

• **Utility.** Deliveries of the twin-engine amphibian Albatross continued on schedule to the Air Force, Navy and Coast Guard.

• **Anti-submarine.** Production of the piston-powered Guardian will continue this year, gradually being replaced by the S2F-1. Grumman expects the newer patrol plane to make up a "sizable part" of its 1953-54 business.

Aro Approved

The way appeared cleared for continued operation of Air Force's Arnold Engineering Development Center by Aro, Inc., following Senate repeal of a provision barring Aro's participation. The repeal completed congressional action on the matter. Presidential approval of the action is assumed, since it was requested by USAF and cleared by the Budget Bureau.

The Aro ban was tacked onto the fiscal 1953 defense budget last year, following charges against the firm by Sen. Albert Gore of Tennessee, home state of AEDC, then a member of the House. Senate approval followed a brief explanatory statement by Sen. Leverett Saltonstall. There was no further floor discussion.

Bell Aircraft Corp.

A significant trend to avionics during 1952 by Bell Aircraft Corp. highlighted president Lawrence D. Bell's report to stockholders of the firm's activities last year. The company's chief executive further emphasized this development by pointing out that 1,133 employes, or more than one-third Bell's entire engineering effort, was devoted to electronics work. Projects included radar, radio remote control, automatic landing devices, several different types of autopilots, guidance systems and servomechanisms.

An increase in profits per share of company stock over the previous year also marked the annual report. During 1952 sales were up 57% over 1951 for a dollar total of $129,514,375 and net earnings after federal taxes amounted to $3,043,441 or $3.46 per share. Earnings in 1951 totaled $1,927,369 or $2.19 per common share. Bell's backlog last year also showed a large increase over 1951: It climbed to $446 million from the previous year's $369 million.

▶**Tops in Copters**—Last year also marked the completion of transfer of helicopter facilities from the Niagara Frontier Division, N. Y., to the Texas Division in Fort Worth where employment was stepped up from 756 in 1951 to 2,614 at the close of 1952.

Stockholders were informed that last year the company delivered more helicopters than any other manufacturer. Although overall figures could not be released, it was noted that 67 rotary-wing craft were delivered in December.

Last year the company also licensed production rights for the Model 47 to an Italian concern and completed negotiation with a Japanese manufacturer. Further licenses are being worked out. Helicopter operations entail employment of 2,812 persons, of which 278 are engaged in engineering and development phases.

▶**Employment**—A considerable amount of aircraft subcontract work continued to fill the company's shops. Work included inboard and outboard jet engine nacelles for Boeing B-47 and RB-47 bombers and outboard nacelles for the Convair B-36. New B-47 engine nacelle contracts were received from Lockheed and Douglas, which are building the Stratojet under license.

At the end of the year the company employed 14,238 persons and occupied 2.7 million sq. ft. of floor space including facilities at three military test bases in the West.

CLEARER VIEW OF MiG from Poland shows sharper detail than earlier radio pictures. Plane is shown soon after Bornholm landing.

Fugitive MiG Closeup Shows New Details

'Notebook' Sketches on Following Pages

New features of the MiG-15 have become evident through studies of the Red fighter that landed recently in Western Europe.

Danish authorities, particularly, have been able to give it close scrutiny, and although there has been and probably will be no official announcement of their findings, other observers who saw the fugitive MiG have noted several small differences between it and Russian-built fighters of the same type in Korea and Germany.

Outstanding differences are emphasized in the authoritative drawings presented on the next two pages. These exclusive sketches were made by a trained observer at the scene of the MiG landing at Ronne airstrip on Denmark's island of Bornholm (AVIATION WEEK Mar. 16, p. 16). They have been combined with measurements taken from the plane itself to make what AVIATION WEEK believes is the most accurate three-view drawing this side of the Iron Curtain.

The new information, coupled with careful interpretation of available pictures, throws additional light on this contemporary Red fighter.

► **Czech-Built**—Although flown to Ronne by a Polish pilot, the plane sketched by AVIATION WEEK's correspondent is believed to have been built in Czechoslovakia. MiGs built to Russian specifications are being produced there at the former Aero- and Letov Works at Vysocany and Letnany.

In addition to the small differences between this plane and those on which there have been previous reports, the picture above and the drawings give evidence that the Russians have had some trouble with the MiG at high speeds and altitudes.

► **Variations**—Only difference in basic outline of the craft is at the jet exhaust, where the exit lip has been cut back and resembles the F-86 Sabre outlet.

Paired wing fences now extend the full wing chord instead of stopping at about 80%, as in earlier versions.

A fixed trim strip has been added to the lower portion of the split rudder.

The radio mast has been moved to the right side of the cockpit and swept aft for drag reduction.

Shape and position of the air brakes have been altered.

A bumper has been added under the fuselage tailcone.

Flaps of the MiG had been reported earlier as split type. But judging from the angle of deflection and amount of extension, they actually are slotted flaps.

► **Trouble Spots?**—Careful study of pictures of the fugitive fighter, taken before it was returned to Poland on shipboard recently, indicates apparent steps to remedy trouble at high speed and extreme altitudes.

The photograph shows that the canopy has been reinforced with gussets at the corners and is no longer a one-piece, free-blown component. What appears to be a strengthening rib runs along the canopy's upper line for its full length. Both reinforcements tell a story of possible pressurization or blowout troubles at high altitude.

Red technicians obviously have given considerable attention to the whole tail assembly. There are mass balances at the tips of rudder and elevators to counteract flutter. The trim strip on the rudder may have been required to cure directional snaking, a failing of many jet aircraft.

The horizontal tail, not adjustable, is fixed firmly to the fin with what appears to be an external reinforcing angle—another clue to tail weakness. Just below the Polish insignia on the side of the fuselage is a strip which looks like another external stiffener. This is riveted to the skin and extends over four fuselage frames, including the steel bulkhead which ties in the vertical tail beam.

► **Armament**—Armament of the fighter consisted of a single 37-mm. cannon on the right side and a pair of 23-mm. cannon on the left side of the fuselage nose.

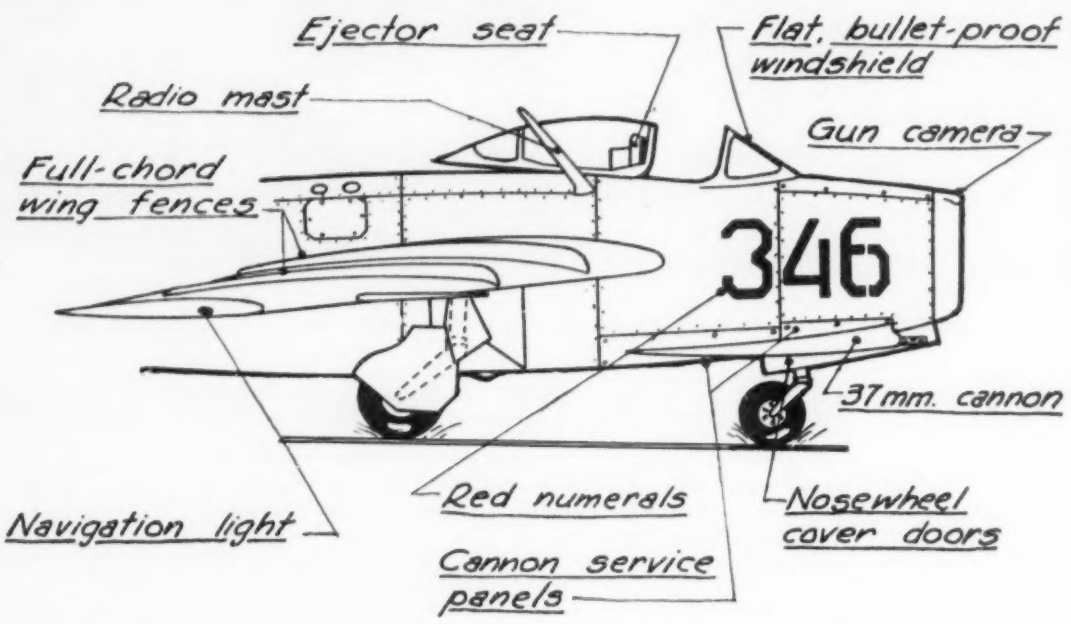
The Polish insignia and plane numerals are painted red; the rudder is a yellow ochre. The airplane finish is highly polished raw metal.

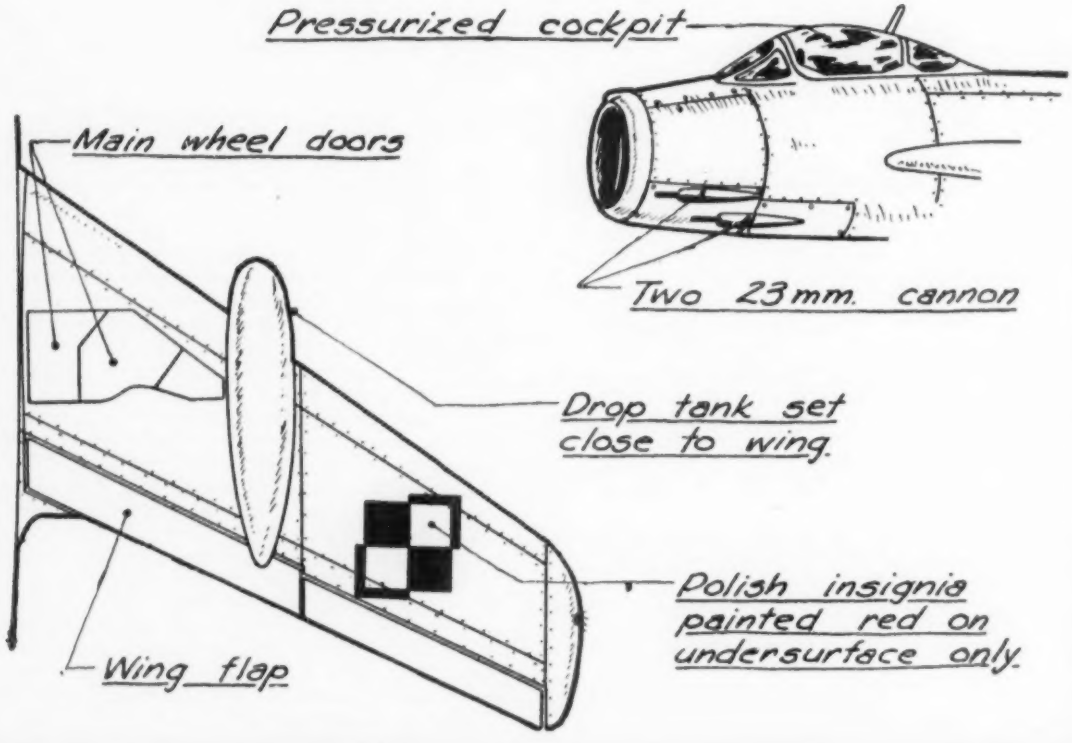
The plane landed at Ronne airport on Bornholm, Danish island, Mar. 5, and gave military officials their first look at an intact MiG. Subsequently it was dismantled, sent to Copenhagen on a naval vessel, and taken under heavy guard to the Danish base at Vaerlose near Copenhagen. From there, after study amid strictest military security, it was returned to Poland on a Polish ship. The pilot was released to go, reportedly, to the U. S. or Canada.

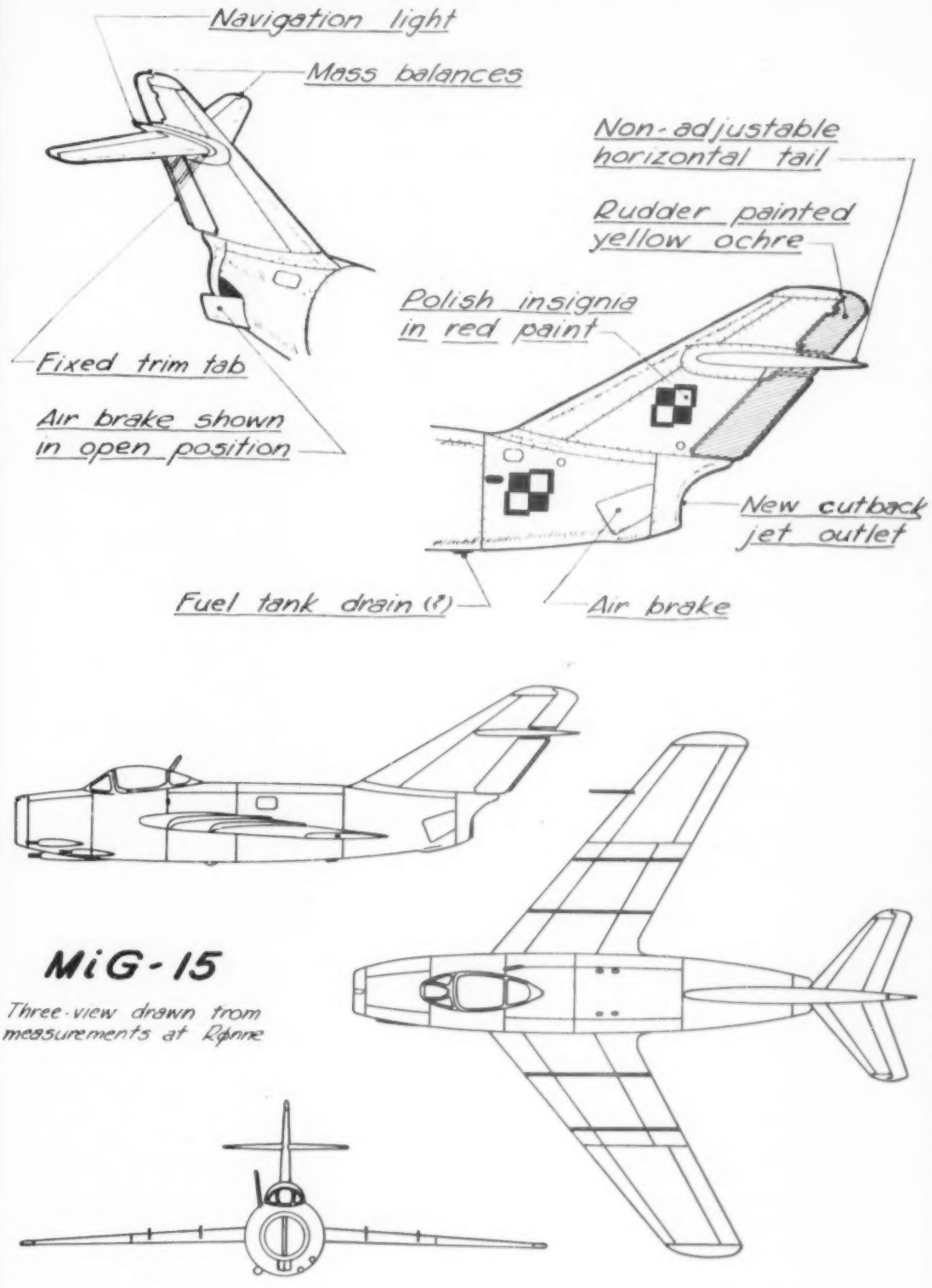
Few persons other than Danish aviation experts were permitted to examine the airplane.

OBSERVERS NOTEBOOK

FUGITIVE MiG-15 AT RØNNE






Navigation light
Mass balances
Non-adjustable horizontal tail
Rudder painted yellow ochre
Polish insignia in red paint
Fixed trim tab
Air brake shown in open position
New cutback jet outlet
Fuel tank drain (?)
Air brake
MiG-15
Three-view drawn from measurements at Rheine

ALPA Sets Jet Liner Standards

What kind of jet-powered transport do pilots want?

Last week Air Line Pilots Assn. (AFL) put together the operational knowhow of its 8,000 flying members and came up with their first answers to this question.

Here are some performance recommendations, screened by ALPA's engineering staff:

• **Stall speed** should be limited, until considerable practical operating experience has been gained, to around 90 mph. for a 6,000-ft. runway, or 97 mph. for a 7,000-ft. runway, at sea level, maximum landing gross weight condition.

• **Basic factors** adversely affecting performance—including temperature, humidity, pilot technique, service abuse, and power loss—should be included in designing jet transports because they are being considered in new Civil Aeronautics Administration regulatory performance requirements now being formulated.

• **Medium-range turbine transports** (approximately 1,750-mi. range and reserve) should be capable of operating on current U. S. runways in the 5,000- to 6,000-ft. category.

• **Long-range jet liners** (2,000 to 3,000 mi.) should be able to operate on 7,000- to 8,000-ft. runways.

• **Speed-reduction devices** such as dive brakes should be capable of operating at a speed sufficiently above the critical Mach number of the airplane to insure regaining control of the aircraft and designed for use in an emergency descent from maximum cruise altitude to about 20,000 ft. in two minutes in event of loss of pressurization.

• **Non-boost control** is desirable; but if a boost system is used, response and feel should be similar to that of large transports now flying. Airplane should be capable of maneuvering and landing without the boost system.

• **Stability and dihedral** should be built into transports to ease the pilot's job of maintaining proper flight attitude, at least pending further autopilot refinements.

• **Control through stall** should be designed into the airplane, with good control at slightly above stall speed.

• **Ground deceleration method** in addition to wheel brakes should be provided, presumably drag chutes or reverse-thrust devices. (ALPA points out that no airliner equipped with a reverse-pitch propeller has had an "overshot-type" accident.)

Highlights of ALPA structures proposals:

• **Fatigue study** should receive greater consideration.

• **Coordination** between structures and equipment engineers during mockup stage should focus attention on ideal locations for service doors and inspection plates, insuring that doors stay on and closed during flight.

• **Leading edge** should be designed for rugged use and for relatively easy replacement.

• **Pod-type powerplants** and landing gear installation should be designed to break off with minimum damage to fuel lines, oil lines, tanks, wiring, etc., in event of emergency landing.

• **Turbulence** encountered in high-altitude flight should be analyzed to assure structural integrity of the airplane to withstand gust loads.

▶ **Fire Protection**—Alternate proposals suggest making baggage compartments accessible to crew for fire fighting in flight or to make a firewall around the baggage compartment that will confine a blaze without endangering surrounding structure.

Equipment and accessories under the floor should be accessible to the crew in flight, ALPA says, and use of noninflammable hydraulic fluid should be encouraged. Heat-resistant materials are proposed to confine fire in an engine area or gasoline heater area. Location of shutoff valves for lines carrying inflammable fuels far enough aft of the engine firewalls to avoid damage in a crash also is urged.

▶ **Emergency Evacuation**—One emergency exit per seat row or at every other window are alternate proposals. A self-energizing impact light also is asked.

Aisle width of present transports should be a minimum, ALPA says. Design of seat cushions to double as life preservers is recommended, with external location and manual operation of life raft installations. The association says seating, including flight attendant's location, should follow Cornell University Medical College recommendations for crash protection.

▶ **Powerplants**—Crash-resistant fuel tank design is called for, along with underwing fueling. Fuel storage is proposed as far outboard of the engines as possible, with preference to wingtip fuel tanks even at the cost of a slight sacrifice in speed.

Powerplant installation is recommended to localize fire in the nacelle so it will not be possible for the fire to damage the airplane structure, affect other operation systems, or progress to the fuel tank area.

Special attention is called to the National Advisory Committee for Aeronautics' recommendations for inerting ignition sources after a crash.

▶ **Deicing**—In recommendations for deicing equipment and cabin heating, the pilots prefer exhaust heat exchangers as less of a fire hazard for wing deicing than gasoline heaters. But if gasoline heaters are installed, pilots say they should be located in the fuselage and accessible to the flight crews.

ALPA also urges reliable windshield deicing, wing lights to detect ice formations and selection of airfoils made on a basis of windtunnel tests for effects of ice accretion.

Other recommendations were:

• Highspeed retraction of landing gear, use of dual tires on one axle with one tire supporting the plane's weight, emergency free-fall and locking of landing gear and design to prevent unwanted retraction on the ground.

• Interconnection of gear and flaps to minimize chance of a wheels-up landing.

• Independent air conditioning system for flight crew compartment with separate temperature controls.

• Electric fuel selector valves and trim tabs are opposed by the pilots, who favor mechanical operations.

• Shoulder harness for crew, including flight attendants, with suitable structure should be mandatory.

An introduction urges that jet designers and operations personnel give consideration to reports of the Finletter and Doolittle Commissions and the National Air Transport Coordinating Committee's study of operating problems.

The material was compiled by Ted Linnert and Carl Eck of the ALPA engineering staff, with the supervision of ALPA president Clarence N. Sayen and 21 veteran pilots from American, Pan American, United, TWA, Eastern, Capital, Braniff, and other airlines.

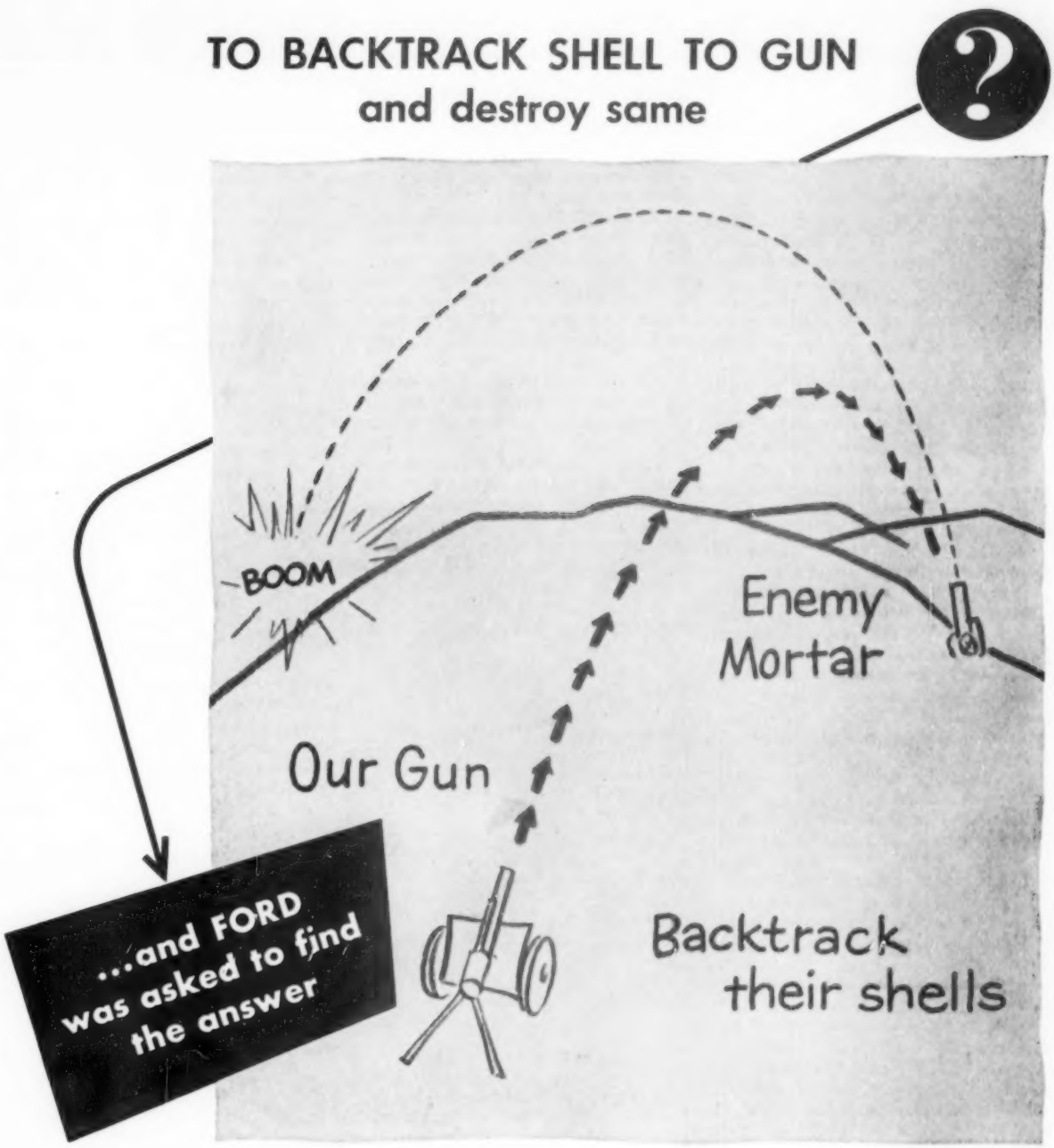
AA's 1952 Revenues Top $187 Million

American Airlines last year recorded revenues of $187,344,000, highest in its history, and realized a net income of $12,514,000 compared with 1951's $162,971,000 revenue and income of $10,549,000.

The big U. S. carrier last year flew 5,094,000 passengers or 24.7% of the total domestic trunkline traffic. A large gain was made in aircoach; last year the total came to 13% of the carrier's total traffic compared with 7% for the previous year. AA sees aircoach service during 1953 being approximately double that of 1952. American's freight and express flights brought in $14 million in revenues last year.

At the end of 1952 the carrier had firm contracts for $64 million in new aircraft and related equipment and another $6 million authorized but not yet committed. Deposits totaling $13.4 million had already been placed with manufacturers.

TO BACKTRACK SHELL TO GUN
and destroy same



Can projectiles be "seen" approaching and their flight backtracked to locate the mortar or gun that fires them? This problem was simply reconciled with special computing equipment designed to be built right into the gun. The engineering of such a computer, the handling of such ballistic data, all falls into the pattern of previous Ford achievements.

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6

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PanAm Reopens Comet Contract

Certification deadline will probably be extended; observers tag CAA objections as largely 'political.'

By Nat McKitterick
(McGraw-Hill World News)

London—Pan American World Airways and de Havilland Aircraft Co. are renegotiating the U. S. flag carrier's contract for purchase of three Comet 3s and option to buy seven more.

But both PAA and de Havilland are determined to get early assurance of an agreement between the U. S. Civil Aeronautics Administration and the British Air Registration Board on certification of the jet liner.

Pan American operation of the Comet apparently depends on whether CAA will agree in principle to accept a certification of airworthiness from its British counterpart, if and when ARB approves the jet liner.

AVIATION WEEK learned exclusively that the manufacturer and the operator are renegotiating their contract. The deal isn't off by any means. Pan American already has made a down payment of about $2 million towards its Comets. Object of the renegotiation is to change a clause in the original contract that sets Mar. 31 as the deadline for a U. S.-British agreement on certification of the Comet. The two parties probably will extend the deadline—maybe until the end of the year.

▶ **Political Disagreement**—The official list of technical requirements on which CAA and ARB disagreed in Washington last month indicates that the certification stalemate is at least as much political as technical. Chances are negotiations soon will be carried on at a higher, diplomatic level.

The certification problem was confused further last week by acting CAA Administrator Fred B. Lee's speech before the Airport Operators' Council in Kansas City. Without mentioning the British directly, Lee paraded a whole army of doubts about the safety of civil jet transports (see story starting on p. 32).

By the time reports of Lee's speech reached here, it was interpreted as a great setback for British hopes for the PAA Comet contract. While the official text of Lee's speech doesn't merit this interpretation, the London press cried "foul" and drew from de Havilland a point-by-point rebuttal.

Both British and American observers here read into the press reports of Lee's speech an implicit accusation that the British were being negligent of the safety factors involved in civil jet operations. To the British, this all smacked of politics.

▶ **Rough Parody**—And their feelings were reinforced by the comments of Americans stationed here. One U. S. official said bluntly: "It's time we told the British frankly that the U. S. aircraft industry is sick and tired of being taxed to death. We're not afraid of competition, but we don't like seeing our export business go by the boards because we are hobbled with taxes. Sure, we have a lobby in Washington. . . ."

This is a rough parody of the prevailing opinion in Britain about the certification squabble. Nobody expects CAA to certify a foreign aircraft before it is flown. The object is to get a most general agreement to the effect that the Air Registration Board is a competent authority; that its standard for civil jets—the only such standards in the world—are sound enough to judge the merits of a single aircraft, the Comet 3. The British think this is the very least that could be expected from governments pledged to "trade, not aid" as a policy.

▶ **Less Than Hope**—Pan American and de Havilland are anxious to get some partial agreement, at least, on certification before many more months pass. PAA wants assurance that it can begin to operate its Comet 3s, in competition with British Overseas Airways Corp. as soon as possible after delivery in 1956. Even more, de Havilland wants assurance that it can start building Comet 3s for the U. S. carrier without running undue risks of expensive design modifications to suit the still unformed jet requirements of CAA. The Mar. 31 deadline in the current contract was always less than a hope, but both sides are anxious to keep up as much pressure as possible and will, therefore, not extend the deadline very far.

Technical talks between CAA and ARB have gone about as far as they can go. CAA's 12-man Jet Evaluation Team is due here next August to study Comet operations further, but the British wonder why an agreement must wait that long? In the Washington talks and since, ARB claims, more data on a single aircraft has been hashed over than any 50 previous cases.

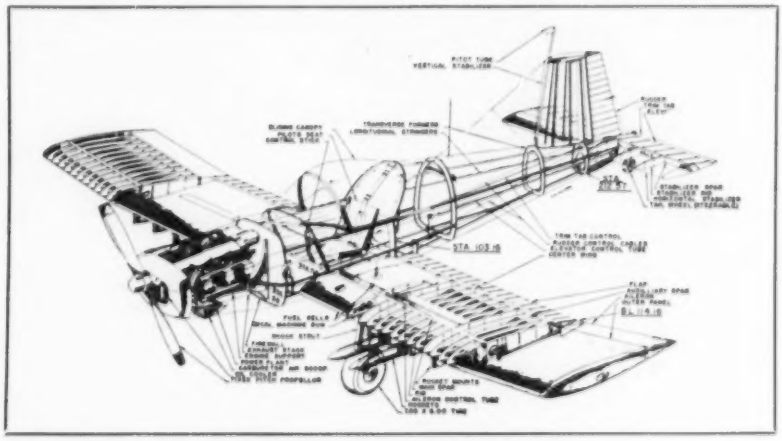
During the Washington talks, ARB and CAA representatives organized three committees—flight, airframe, and powerplant. These committees went over in minute detail CAA's Proposed Airworthiness Requirements for U. S. Jet Transports (dated January 1953). Object: to see how ARB's requirements for jets fitted in.

(Before they left for Washington, the British team was told the negotiations would be based on CAA's January 1952 requirements report. The January 1953 report was not shown to the British until the first meeting.)

In addition, CAA insisted that the meeting cover in detail all the items in CAA R4 requirements for *piston* engines. This was done despite conclusion some years ago of an Anglo-American reciprocal agreement on requirements for piston engine aircraft.

From all this analysis, three classes of conclusions were reached:

- **Class I,** covering roughly 50% of the items in both documents, represented complete agreement.
- **Class II** conclusions, representing



FLETCHER FD-25 DEFENDER

Construction details of the little Fletcher FD-25 Defender single-seater, designed for close support of ground troops show simple fuselage. Defender is slated for production in Japan. The first has been shipped there. Powerplant is a 225-hp. Continental and top speed is 187 mph. Gross weight is 2,500 lb. Provision is made for rockets and a .30-cal. machine gun in each wing of the light aircraft.

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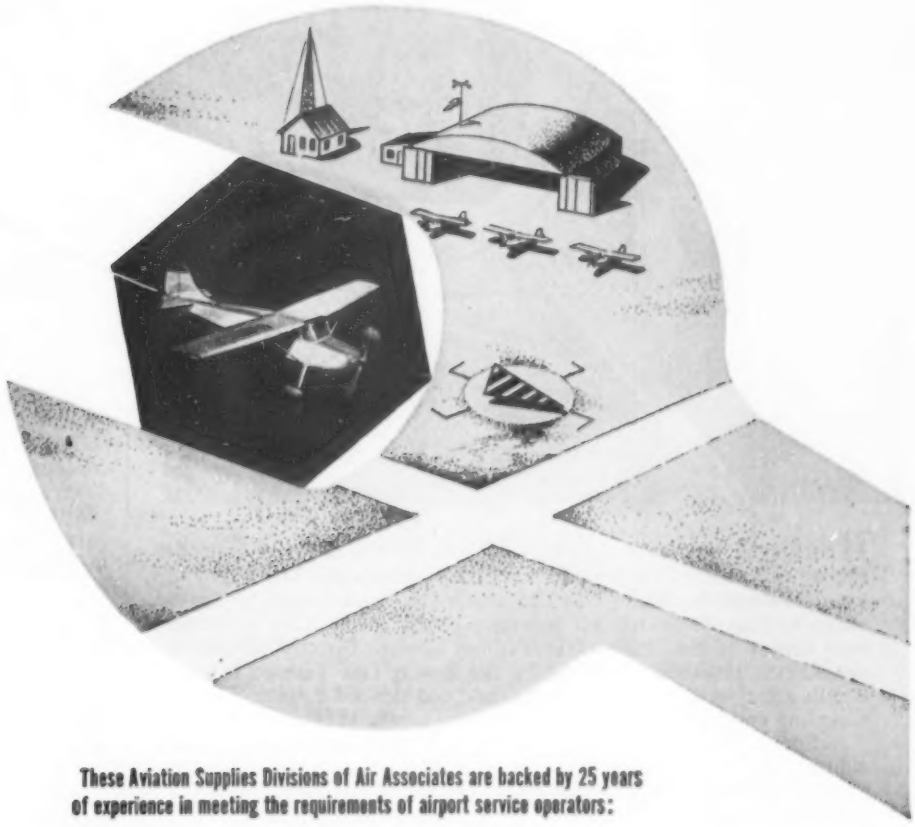

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about 49% of the items reviewed, covered items where the British felt there was complete agreement but where the CAA felt more evidence was needed. On Mar. 19, the additional evidence of good faith on Class II conclusions was forwarded from ARB to CAA.

• **Class III** conclusions covered the points of disagreement. Item by item, there follows the first official list of these points.

• There were four points of performance covering takeoff path, temperature accountability, climb and landing distance that CAA insisted should be figured on the basis of stalling speed squared. The British have opposed this standard for many years in negotiations over piston types. At the coming International Civil Aviation Organization meeting in Paris in May, the British have been told, the U. S. officially will abandon this yardstick, adopting instead a basis for requirements on these points in line with British methods. There is, in fact, an ARB official in Washington now helping CAA convert its requirements on a basis other than stalling speed squared.

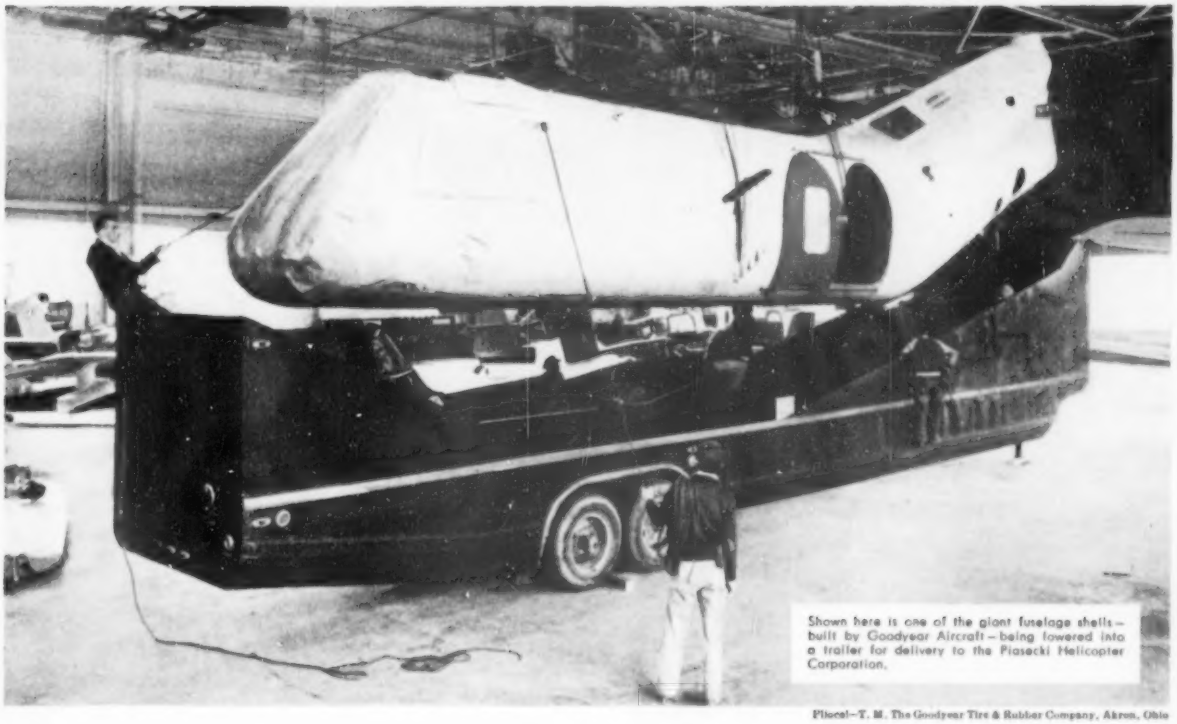
• CAA specified special shapes for control knobs on the cockpit panel. The British refused flatly to comply. They were surprised to find that no U. S. aircraft complies with this requirement.

Airframe Committee

• CAA said trim tabs must be separately controlled so that the pilot can land with his main control out of action. The British claim this can't be done on a jet; that trim tabs serve a different purpose. The Comet, with two completely independent hydraulic systems—trim tabs tied in admittedly—is adequately safeguarded, the British say.

• The U. S. aeronautics agency insists on double panes in windscreen and windows on jets operating at 40,000 feet. The British argued that two panes are no better than one, sufficiently stressed. Nobody denies that explosive decompressions at 40,000 feet would be fatal, ARB says, but it shouldn't happen any oftener than a wing falling off. The British board claims the Comet 3 windows have been tested to better than 160 psi. and that the pressure differential at 40,000 ft. is 8¼ psi. And the British start with a safety margin of 10 or 12 to one.

As the manufacturer, de Havilland has another point. Comet 2 windows are square; Comet 3 windows will be oval. This minor design change saves no less than 300 lb. structure weight in the Comet 3. Two panes of glass could be put in, but to conform with the weight-saving design, the designer



Shown here is one of the giant fuselage shells—built by Goodyear Aircraft—being lowered into a trailer for delivery to the Piasecki Helicopter Corporation.

Pliocel—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

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AMONG helicopters, the 14 to 20 place, tandem-rotored Piasecki H-21 — known as the "Work Horse"—has a greater load-carrying capacity than any other helicopter in U. S. military service.

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In 1950, Goodyear Aircraft teamed with Piasecki for the engineering of the original "Work Horse" fuselage—applied its manufacturing experience and ability in various fields to save weight and solve many of the problems attendant to the design of this famous rescue and utility transport.

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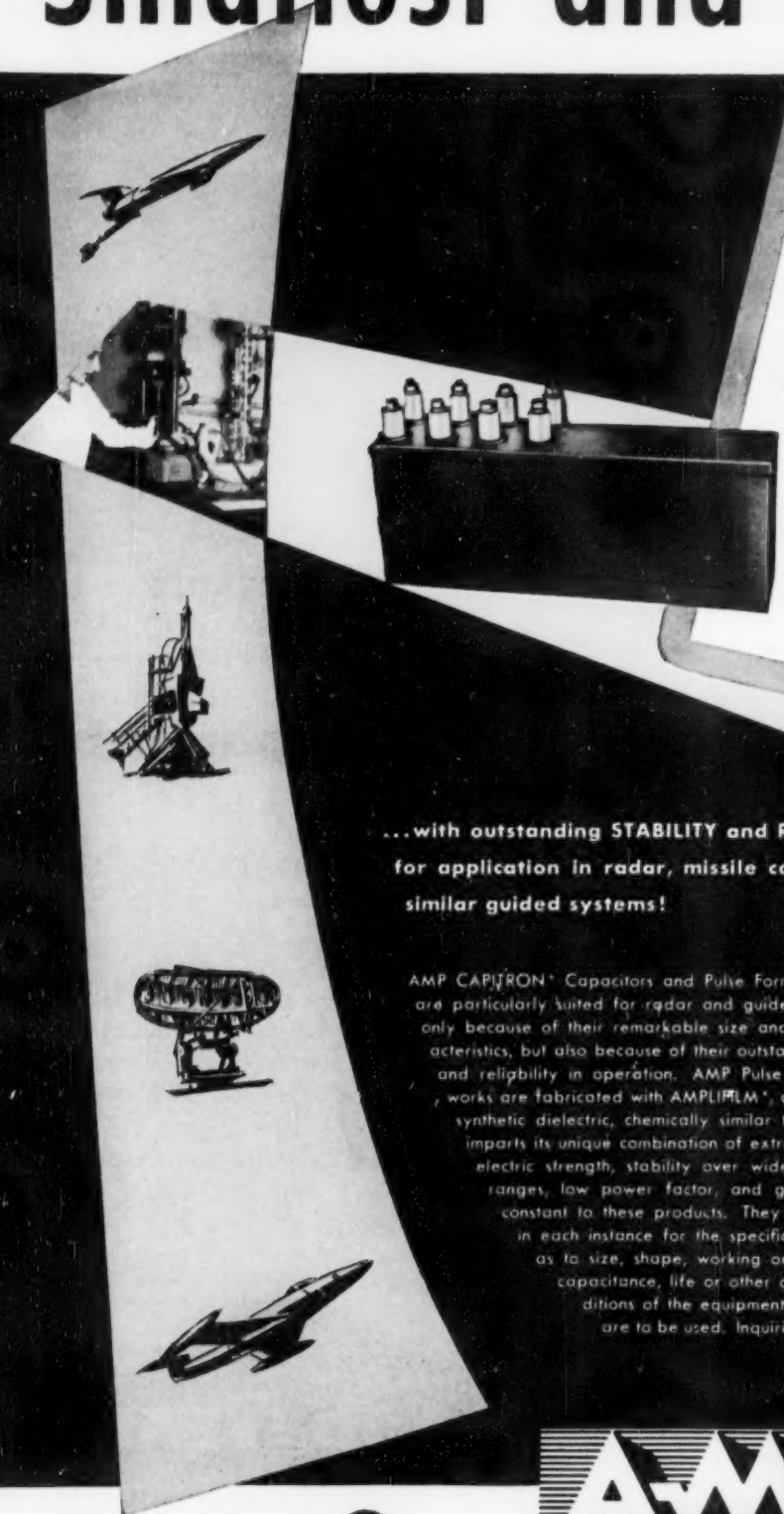

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would have to cut his safety margin in half.

• CAA insists on static and in-operation control tests. The British don't run these now but will if the customer desires.

• The U. S. wants outward opening doors for easier escape in case of a crash. The British claim inward opening doors are absolute musts on jet operation. "To design a Comet with outward opening doors," one British official says, "would be to ask the operator to do away with half of his passenger-carrying capacity—such is the weight factor involved." Besides, the British say, U. S. industry isn't complying with this.

Powerplant Committee

• CAA, provisionally, thinks civil jets should be equipped with a "thrust meter" to indicate loss of engine power or an engine cut-out. The British claim they know of no such instrument that has been proven yet. If one comes, they'd be glad to consider it. Meanwhile, they claim, present Comet drill, whereby the co-pilot is charged with reading rpm., temperature and other gauges during takeoff, should be enough to detect any engine cut-out or loss of power.

• Provisionally, CAA says engines should be so located that, if a turbine wheel broke loose, damage to the wing or cabin should not necessarily follow. This the British see as a veiled attempt to make podded engines mandatory on civil jet transports. Pointing out that hundreds of thousands of hours' operation with jet engines has yet to provide a single instance of a turbine wheel flying loose, the British contend such a disaster, even in podded engines, would at least rip the wing off.

• CAA insists on complete engine isolation as far as its fuel system is concerned. The British have adopted this as a beneficial and necessary modification in the Comet. Only a slight modification is necessary, but it is being put into effect now.

• The U. S. says determination of unusable fuel supply (due to the particular configuration of a fuel tank) should be made on each and every aircraft. The British do it only on the prototype but would be willing to oblige a customer for all his aircraft if wanted.

• Provisionally, CAA is thinking of a requirement to allow the pilot to stop an engine completely whenever he wants. In a jet, this means providing shutters over the air intake. The British only require that the pilot be able to idle his engine at 1,500 rpm.—the rpm. caused by air ram into an idle engine during flight. The ARB admits shutters could be provided for a customer.

▶ **General Disagreement**—In his speech

(Advertisement)

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

You can get lost in a valve—at least I can, when an expert explains it.

Fred Space is an expert, a Whittaker field engineer, and he undoubtedly thinks I'm awfully dumb, for he lost me completely in a beautiful little plastic hexagon only two and a half inches high.

A cut-away training model of Whittaker's landing gear selector valve for the Douglas C-124, the unit looked simple enough at the outset. Trouble was, Fred sparked the design and he knows it perhaps better than he does his own living room. When he started detailing ports and positions, "Shear-Seals," levels, passages, galleries, flow patterns, etc., I gave up.

"Look," I said, "why don't you draw me a diagram? Maybe I can follow you better."

This was a mistake, as you'll agree if you're not an engineer and have asked some engineer for a quick sketch. The lines and the arrows, the circles and the letters were simple enough to him, but to me they spelled nothing but confusion.

The blank look on my face brought his pencil to a trailing pause on the scratchpad. He mumbled like a man who knows the cause is lost and I caught four words:

"I'll get the blueprints . . ."

"Wait a minute, Fred. The prints will foul me up even more. Let's try it again, but let me ask questions."

"Okay." He sat back in his chair, resigned to his fate.

"This valve is a . . ."

"A landing gear selector valve."

"Basically what does it do?"

"It gives the pilot of a C-124 quick and positive control of his gear by controlling a small flow of fluid that in turn controls a 3000-pound hydraulic system in the belly of the ship."

"How did it come about?"

"Well, Douglas wanted to use as much of the C-74 hydraulic system as possible in the C-124 and they wanted to add to the regular gear control an emergency hydraulic source control and a unit to pressurize or de-pressurize the system."

"So . . . ?"

"We realized the linkage, the overrides, the plumbing in general would be far too heavy and complicated, and furthermore the pilot would have three operations: one to pressurize the main system, the second to operate the gear, and a third for emergency selection if the main system failed.

"So we figured why not combine the thing into one unit to do away with the weighty linkage and give the pilot but two operations—one to pressurize the main system and at the same time raise or lower the gear, the second for emergency selection—both with a single handle."

"Must have been some job."

"Yeah, five months to first delivery, which is plenty fast. Engineering started work in September, 1948, and it took three months to design and develop. You should have heard the shop guys when we brought 'em a rotor drawing with four galleries at two levels, 20 holes, passages every which way and a required surface flatness of 11.6 micro-inches! We must have made a million drawings before we got that one figured out!"

"Just what does the valve accomplish?"

"Well, first it cuts out a lot of rigging yet keeps the same basic control linkage of the C-74. It gives positive control and reduces pilot operations and therefore reduces the chance of pilot error. It eliminates weight by fifty percent or more and pulls down the chance of leakage by cutting the number of fittings some thirty percent. It requires far less space as a combined unit and knocks both the cost of installation and the purchase price down about sixty percent."

"How much does the valve weigh?"

"Only a pound and a quarter—works like a dream, too."

"Have there been any further developments of it?"

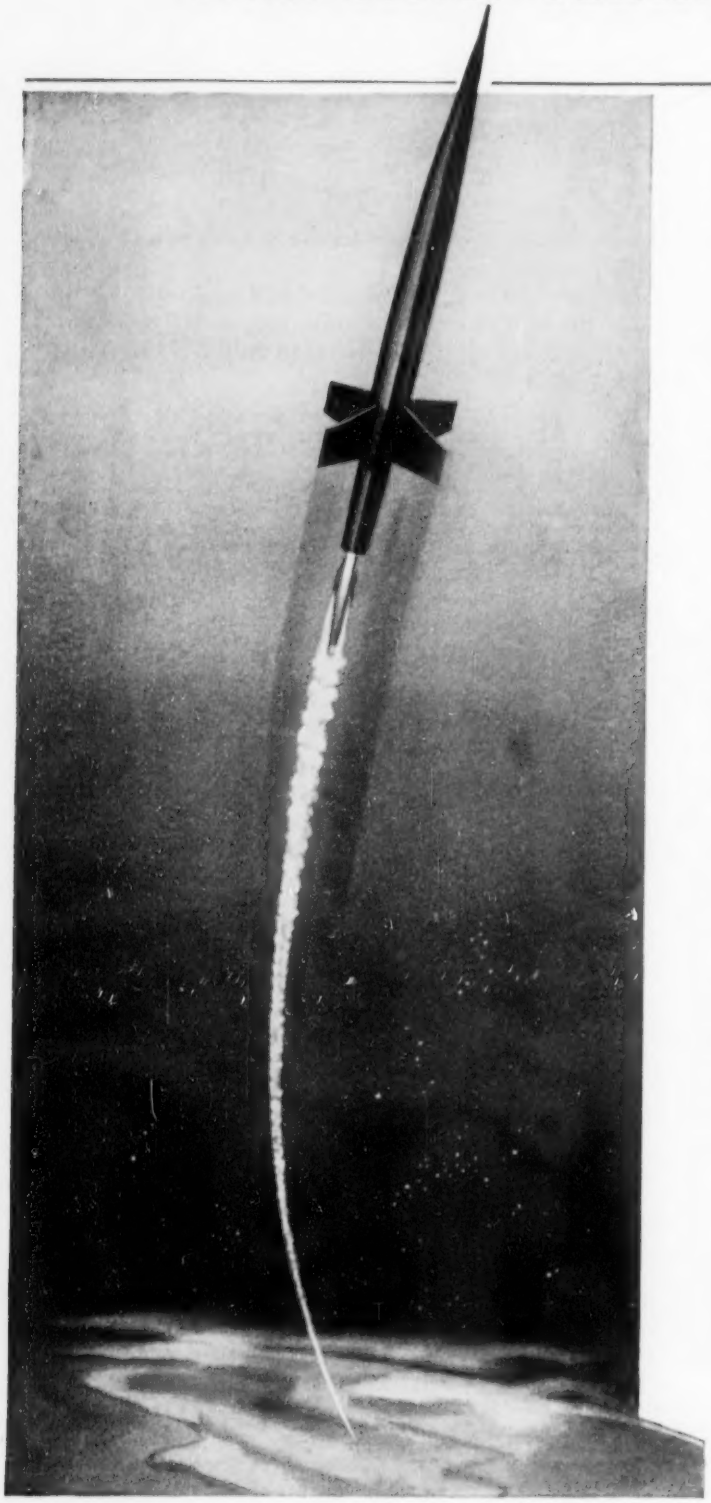
"Sure. You see it's a special valve for a special purpose, the C-124—but there have been refinements. The landing gear unit is a seven-port, four-position valve with seven 'Shear-Seals' and . . ."

"Wait a minute, Fred. Let's not dip into that technical stuff again."

"I was just going to say we've got practically the same thing for C-124 flap controls, but it's a six-port, three-position affair with five 'Shear-Seals' and . . ."

"Thanks, but I think you've given me enough to point up Whittaker ingenuity. See you later, Fred."

What JACK & HEINTZ *is doing about...*



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For aircraft generator requirements, we have developed environmental-free units completely independent of altitude or speed and incorporating new concepts in the cooling of electrical equipment.

J&H Model G75 a-c generator is the first in the industry to incorporate a cooling system utilizing the vaporization of water.

Another generator, our Model G37, is cooled with a chemical coolant, circulating in a closed recirculating system. J&H Model G38, while still a blast-cooled unit, can be considered environmental-free, since it incorporates a cooling method utilizing bleed air from the pressurized cabin.

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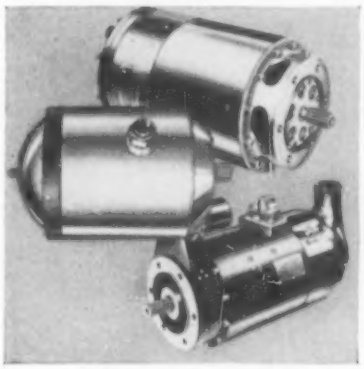
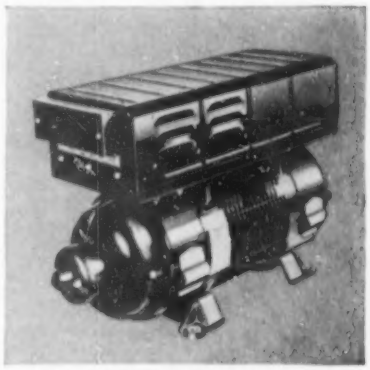


Top to bottom, G37 Generator, G75 Generator and G38 Generator



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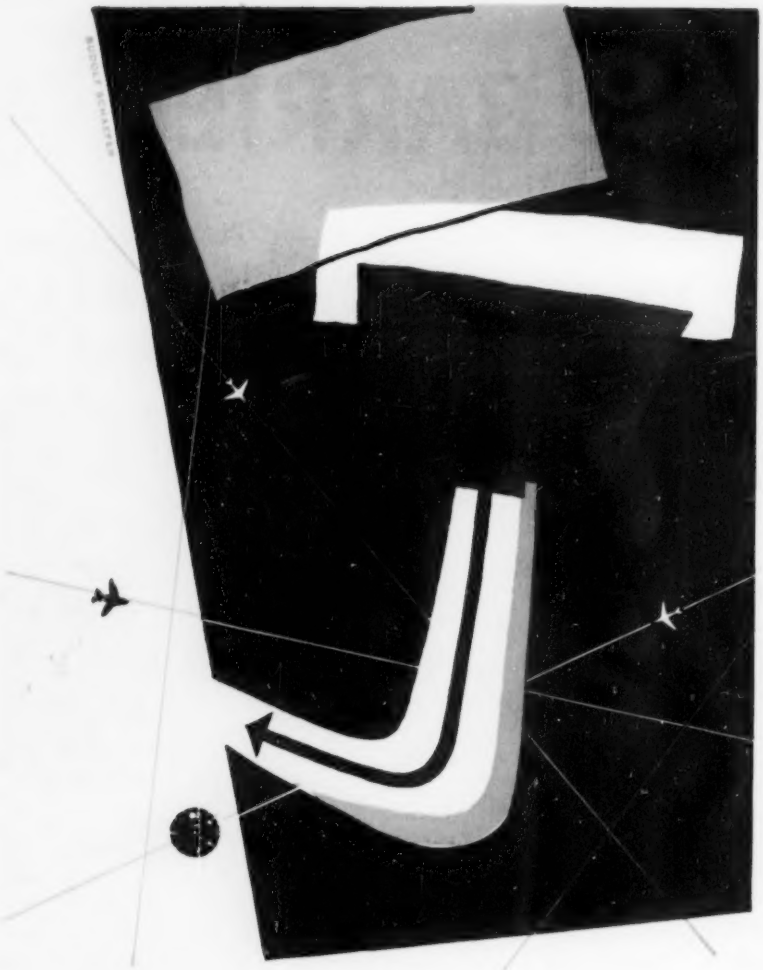

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in Kansas City, CAA Administrator Lee brought out a few more general points of disagreement. One important one: "The thrust of jet engines under static conditions is very low compared with turboprops. Also, there is no slipstream over the wing in a jet plane. For these reasons, the takeoff acceleration is low and the early climb of the aircraft is flat."

In the case of the Comet, as was disastrously shown in the two Comet crashes, the engines will not build up speed on takeoff when the tail is down. In this situation, the tremendous drag of the big wing and large flaps is too much for the powerplant. As a result of the Karachi crash of a Canadian Pacific Airlines' Comet on Mar. 2, steps are being taken to correct this—probably by installing a stall warning indicator in the tail, either a tail bumper or tail probe.

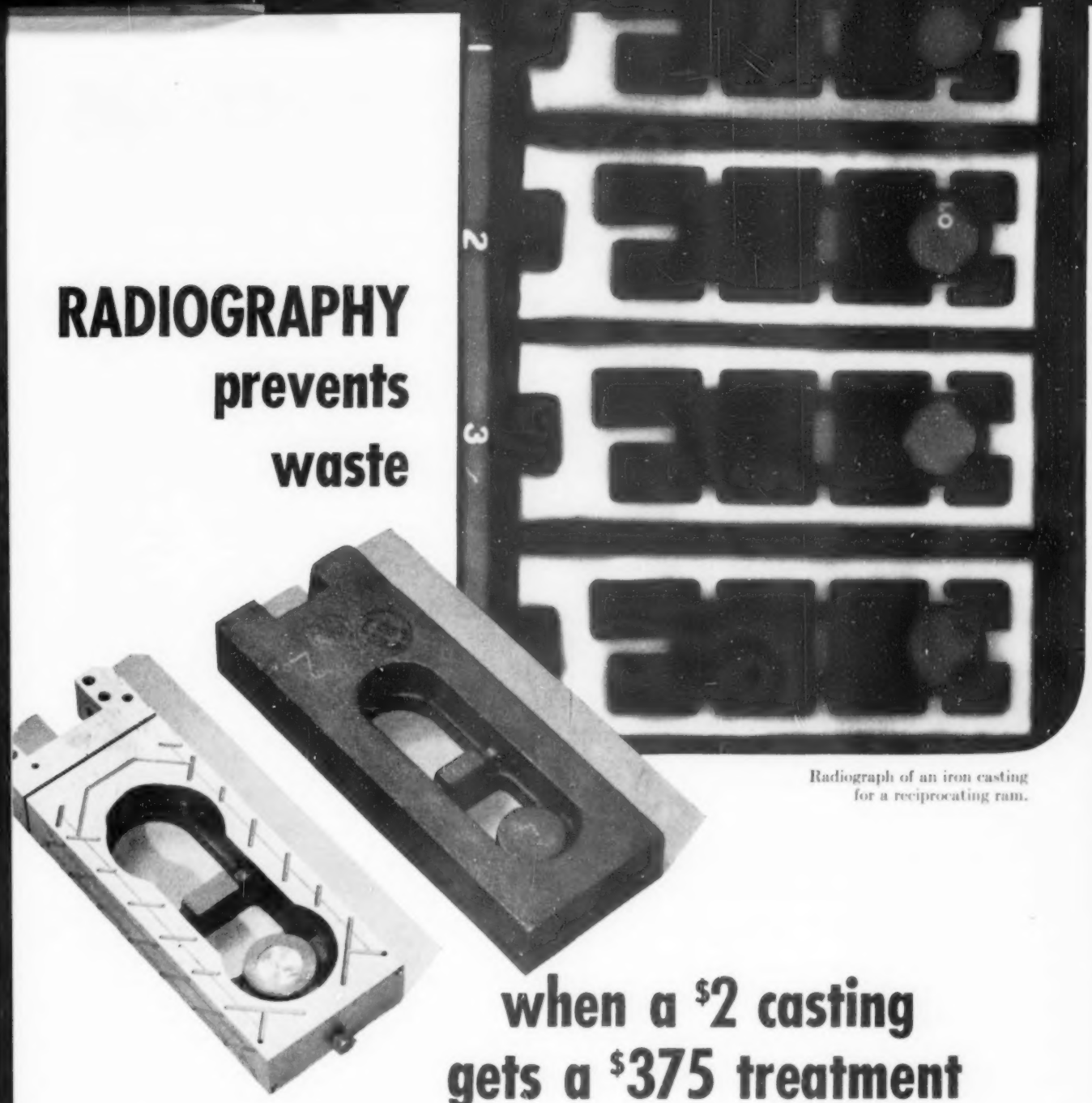
But in normal conditions, de Havilland claims, "takeoff acceleration of a jet aircraft is no worse than that of a propeller-driven aircraft, and the angle of climb is considerably better." Lee also had some points to make of the landing characteristics of jet aircraft. "The absence of propellers and reverse thrust," he said, "plus high approach speeds and clean aircraft contours, combine to make stopping very difficult on runways of moderate length. . . . We feel that civil jet airliners should be designed to use existing runways."

There isn't any way yet of reversing thrust on a jet, although experiments are going on both in Britain and the U.S. But, D-H says, "the Series 3 Comet, under standard conditions, re-

TARGET MARKERS

These lethal-looking rockets mounted under the wing of a North American T-6 Mosquito have chemical-packed warheads which release smoke when they hit, marking Communist targets for speedier UN fighter-bombers. The slow T-6s range the North Korean battlefront spotting targets hard to see from a fast-moving jet. This plane belongs to the Fifth Air Force's 6147th Tactical Control Group.

RADIOGRAPHY prevents waste



Radiograph of an iron casting for a reciprocating ram.

when a $2 casting gets a $375 treatment

This is a casting for a reciprocating ram. It is to be machined and hand scraped to a final flatness of less than .0001 inch. Should porosity show up during machining, the cost of work done and heat treatment is wasted. The part must be scrapped, not scraped.

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quires only 6,000 feet of runway to clear an obstacle 50 feet high at the end of the runway with one engine failing at the critical point—and this with its maximum gross weight." Aside from the fact that Series 1 Comets are certified for ordinary runways now, Series 2 Comets will be equipped with Maxaret brakes which can bring the aircraft to a stop in 450 yards.

CAA Ready to Talk With ARB

By Alexander McSurely

Civil Aeronautics Administration wants to cooperate with the British Air Registration Board in early certification of the Comet 3 for Pan American World Airways' use, CAA administrator-designate Fred B. Lee has told AVIATION WEEK, but there are definite safety responsibilities involved which cannot be entirely bypassed.

Lee said CAA's Technical Committee on Jet Transport Requirements stood ready to go over to Great Britain much earlier than August or September, if the ARB was ready to resume talks on the matter.

Lee said any inference that CAA was raising technical problems to cause unnecessary delays for political reasons is entirely unfounded and that the questions raised were ones that properly should be handled on a technical, not a political, level.

▶ **West Coast Tour**—CAA's working group, headed by George W. Haldeman, has just completed a tour of the principal U. S. transport manufacturers on the West Coast to check against industry criticism of CAA's 1953 Statement of Policies for Turbine Transport Certification. The committee also visited the USAF Directorate of Flight Safety Research at Norton AFB, Calif., to make a study of data available on military jet accidents.

Generally, the committee reported, the industry discussions tend to substantiate the validity of the 1953 policy statement. (For details of statement see AVIATION WEEK Mar. 2, p. 36.)

CAA's position in the recent Washington discussions with the ARB was largely based on this statement of policies.

▶ **On the Beam**—"At every session," Haldeman, chairman of the committee, said, "we were told that we were on the right track, generally speaking. Of course there were some things which we had questioned that all the manufacturers had not yet investigated, but one engineer told us that we were 95% on the beam. And there was very little specific criticism."

One valid criticism raised, Haldeman said, was that the CAA turbine transport policies include safety problems not exclusive to jet transports but common to all highspeed aircraft at high altitudes.

However, this criticism probably will be met by changing the title of the statement of policy, rather than eliminating the not exclusively jet problems.

▶ **Policy Justified**—Haldeman says there is ample justification in classified USAF accident reports of jet engine component failures for CAA's proposed requirement for jet engines to be positioned so they will not cause a major structural failure of the airplane, if something lets go.

CAA has not taken a firm position by insisting on double-pane windows or on outward-opening doors of pressurized cabins, despite British statements to this effect, Haldeman said.

At Van Nuys, Calif., Haldeman, was checked out in a T-33 jet trainer as a part of the committee's familiarization program with jets. He also flew as observer in an F-94C Starfire jet interceptor.

▶ **Drag Rise**—One thing that his jet flying experience indicates is that CAA has over-estimated the problem of a pilot flying a jet transport inadvertently into sonic difficulties. The drag rise encountered as a plane approaches the speed of sound is such that Haldeman believes it would be virtually impossible for a pilot unknowingly to get into the sonic region in level flight.

▶ **Planes Reviewed**—The committee itinerary:

• **Douglas.** The CAA jet committee reviewed development work on the proposed DC-8 jet transport and also turbine propeller work on the YKC-124B.

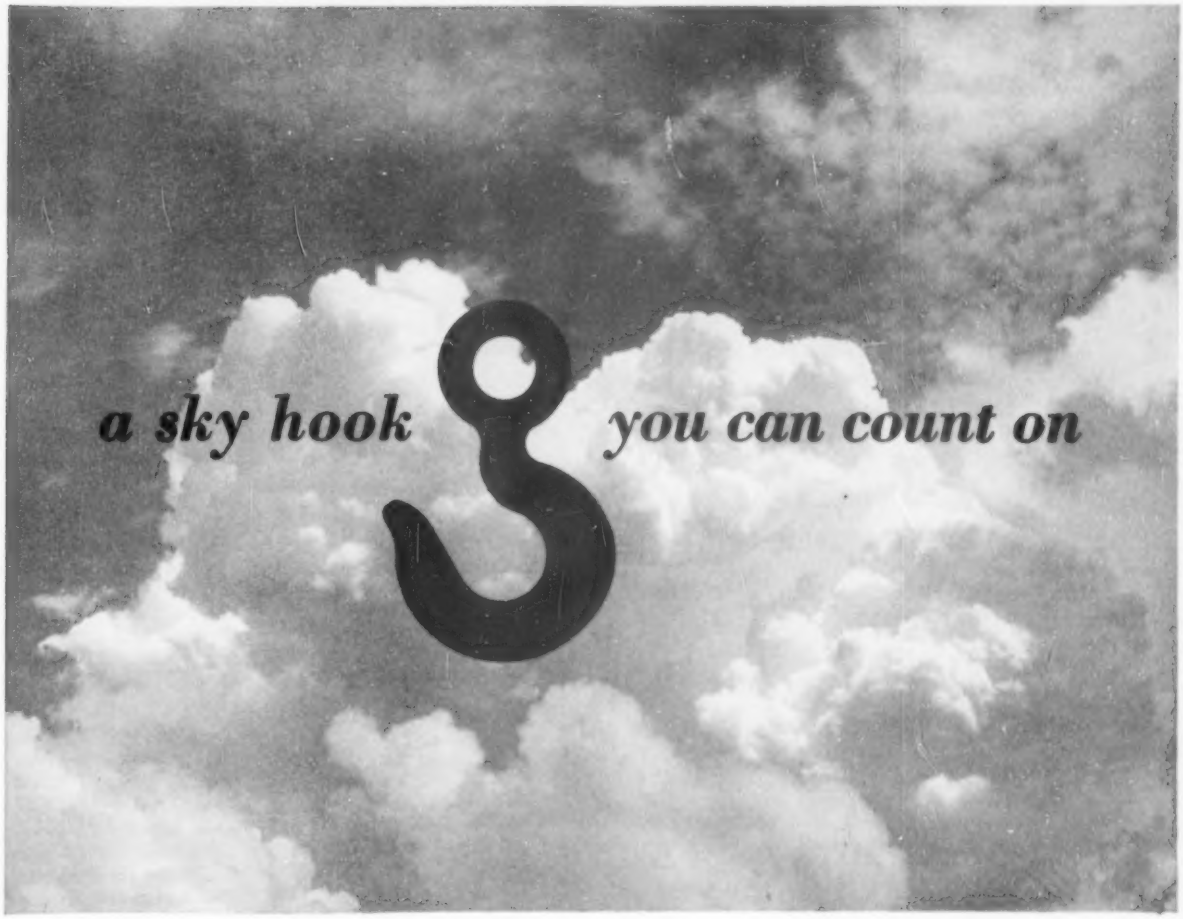
• **Lockheed.** They discussed Lockheed's jet transport program, the Navy R7V-2 turboprop Constellation and the four-turboprop USAF C-131 cargo plane.

• **North American Aviation.** They reviewed the general jet transport picture with a design group which North American has set up to keep current on jet transport design problems.

• **Seattle.** They discussed details of the new four-jet sweptwing transport which Boeing expects to have flying sometime in 1954.

• **Convair.** The committee discussed jet and turboprop designs generally.

Following a short period to digest the information compiled from the industry visits, the CAA jet committee will begin to visit military service air research, development and test centers and the NACA laboratories for further investigation of problems affecting the jet transport. This phase of the work is expected to be completed in June, when a report summarizing the committee's findings will be prepared.



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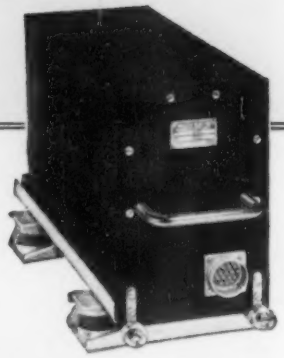
SPECIAL NEWSLETTER

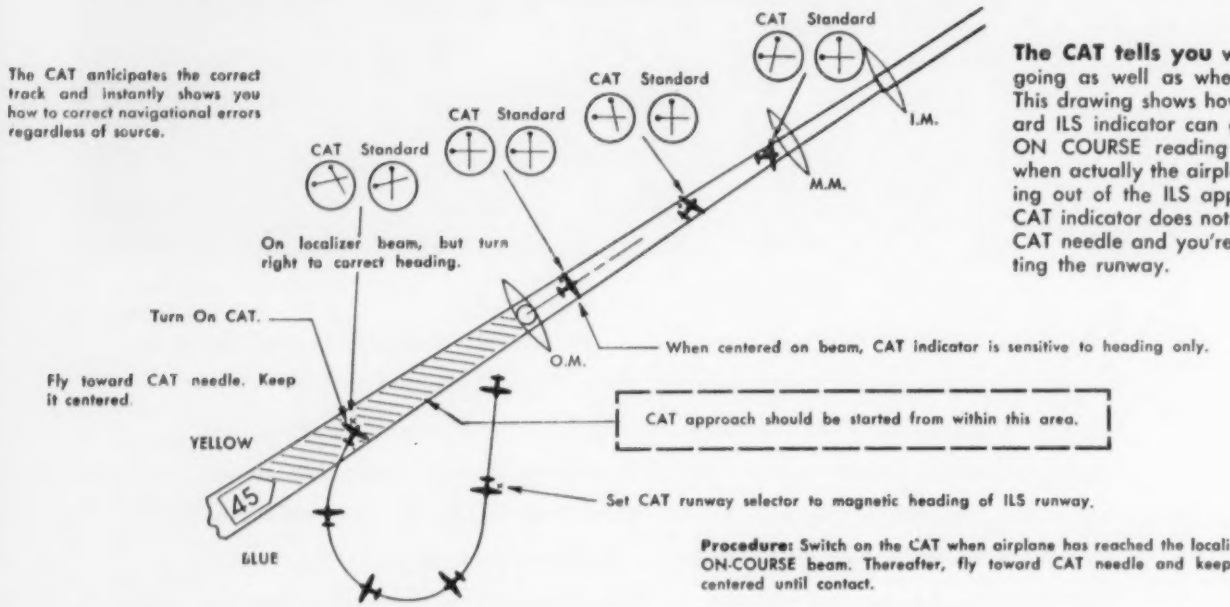
Of vital interest to airline management, this newsletter describes the latest, simplest answer to the problem of precision ILS approach . . . the new *wilcox* CAT (Computing Automatic Tracker)



Why the CAT? It's well known that a common fault of the ILS approach system is the problem of continuing the approach once the airplane has strayed off course...either because of turbulence, cross-wind or pilot's attention being diverted. If this happens during the latter phase of the approach, the pilot may find it impossible to regain proper alignment.

The CAT tells him when he's off course, when and how much to turn to get back on. It obtains heading and position information from the stabilized compass and localizer receiver equipment and computes a steering course signal for the pilot to follow.

Possible for unit to pay for itself in just a few missed approaches. The CAT eliminates fine bracketing at most critical part of the letdown. It eliminates chance of airplane being displaced from a safe landing position and missing the ILS approach. The CAT needle represents a beam that is actually a track to the runway.


The CAT anticipates the correct track and instantly shows you how to correct navigational errors regardless of source.
CAT Standard
CAT Standard
CAT Standard
CAT Standard
I.M.
M.M.
O.M.
On localizer beam, but turn right to correct heading.
Turn On CAT.
Fly toward CAT needle. Keep it centered.
When centered on beam, CAT indicator is sensitive to heading only.
CAT approach should be started from within this area.
YELLOW
45
BLUE
Set CAT runway selector to magnetic heading of ILS runway.
Procedure: Switch on the CAT when airplane has reached the localizer ON-COURSE beam. Thereafter, fly toward CAT needle and keep it centered until contact.

The CAT tells you where you' going as well as where you ar This drawing shows how the stan ard ILS indicator can give you ON COURSE reading of positi when actually the airplane is hea ing out of the ILS approach. T CAT indicator does not. Follow t CAT needle and you're sure of h ting the runway.

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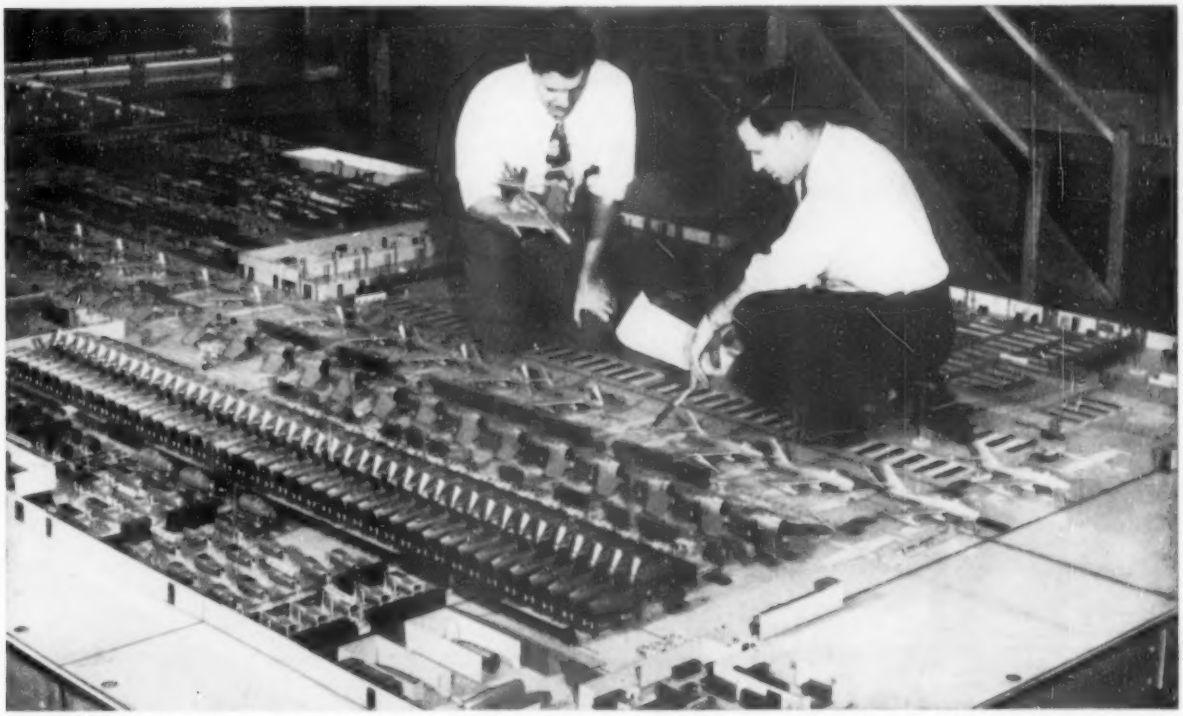


PLANT LAYOUT experts, working with F-84F models, are among the Republic groups helped by new simplified planning sheets.

Republic Finds Way to Beat Engineer Shortage:

Break It Down, Make Things Simple

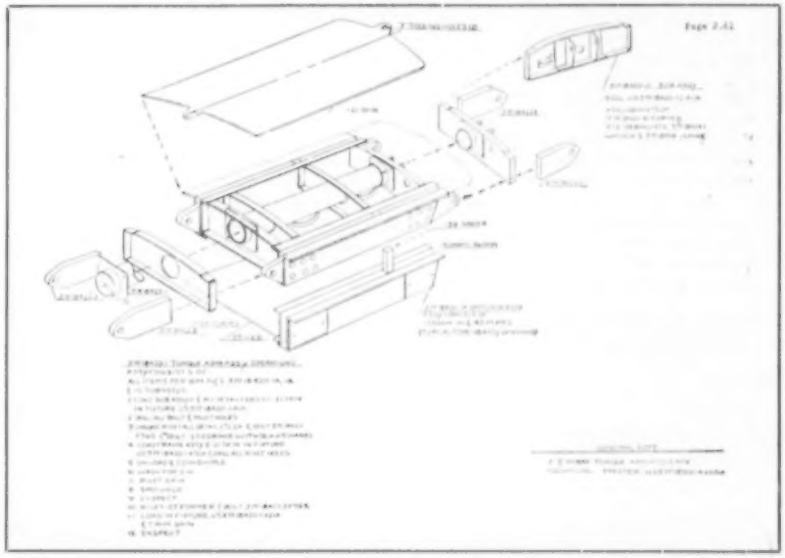
- **Skilled group writes the planning layout sheets.**
- **Relatively 'green' men can take it from there.**

By Irving Stone

The continuing shortage of trained technical personnel has forced Republic Aviation Corp. to initiate its own training and work simplification programs.

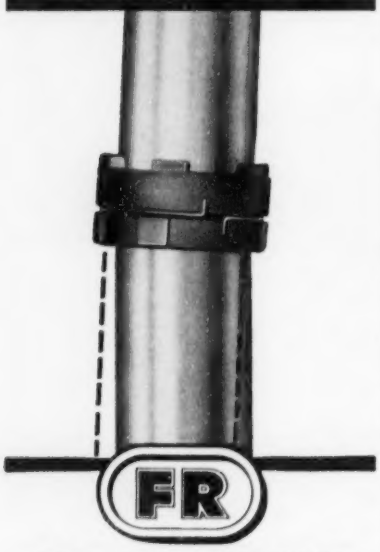
Under the work simplification program, top Republic engineers have created a system of planning layout sheets that allows a relatively inexperienced newcomer to turn out detail operations sheets for complicated jet aircraft.

►**Skeleton Force**—Back in 1950, Republic, like other manufacturers in the aviation industry began to feel the sharp pinch of engineering talent scarcity. Along with demands of prime manufacturers, even shops which were not in aviation began to sense the mushroom-



DETAIL OPERATION SHEET is prepared from planning layout. Normally this sheet would have to be prepared from mass of detail on engineering drawing—not an easy job for a man with limited experience in aircraft manufacturing procedures.

Speaking of
BENDING



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ing potential for subcontract work and to hire engineering and related talent.

As Republic saw the situation, one area where a great need was going to exist was in manufacturing—simply because mass production of a jet plane is a considerably tougher job than was the construction of its World War II counterpart.

The company knew it was going to process the F-84G, the F-84F and the RF-84F; a big job was ahead.

Urgent problem was the development of a Manufacturing Methods setup from a sustaining force—a minimum group which processes aircraft engineering changes—to an organization able to prepare new projects for production.

The F-84F and the RF-84F were almost completely new designs. When these projects loomed, the sustaining force consisted of only about 35 men.

▶ **Too Many Details**—The methods engineer gets the complex engineering drawing and determines the basic plan for building the airplane.

Republic's sustaining force of 35 engineers in Manufacturing Methods was experienced in the over-all aspects of airframe fabrication. They were saddled with the burden of basically planning the aircraft building scheme, determining the major jig points, ordering the master, assembly and subassembly tooling, writing assembly operation sheets, and finally carrying it down to the actual procedure for producing the detail parts.

It was soon realized that the sustaining force couldn't possibly handle the load involved with the F-84F and RF-84F projects. Even though it was a closely knit, experienced team, the burden of detail prevented effective liaison with other departments—Plant Layout and Equipment, Time-Study and the Production Shop.

It resulted in their not being able to give advance familiarization of the problems associated with the new projects. These departments needed time to evaluate the problems and offer recommendations for change based on their experience.

▶ **Activity Split**—It was decided to reorganize the Manufacturing Methods section into two departments—Methods Planning and Processing—and expand the force. Actually this change took place in the middle of the F-84F project.

- **Processing** would handle detail operation sheets and tool orders.
- **Methods** took over all the other functions of the previously consolidated department. In addition, it handled all contacts with design activities, gave technical assistance to subcontractors, effected liaison with other company departments.

The greatest need was to get men for the Processing department. Experienced personnel were almost impossible to come by, so Republic had to do the next best thing—solicit men with promising aptitude and train them to fit into the manufacturing scheme.

Prime aim was to get men with engineering degrees—fresh out of school, with no aviation experience. Wide solicition found only a few of these.

To get the best below engineering-degree level, Republic screened others, looked closely at their background of work in industry and their schooling. Availability here, too, was meager.

▶ **Planning Layouts Devised**—It was realized that even with good, basic familiarization, graduate trainees would need more help, so Republic "picked the brains" of its experienced engineers in Methods Planning to devise a means of simplifying the job.

Methods came up with a series of planning layout sheets to show just how the airplane would be built—a complete breakdown picture.

The planning layout sheet emerged as a production illustration of the part to be manufactured, with a description of the tools and operations required to accomplish a particular assembly.

These one-sheet picture-and-note stories were the concrete translation of the experienced thinking of a small group to guide the inexperienced newcomers by giving them a thorough job analysis in a form that could be digested without great effort. The sheets eliminated for the new man the tremendous amount of groping he would have to do in translating the engineering drawing into a finished conception.

From this planning layout, detail operation sheet writing becomes more or less a routine task.

Previously, the operation sheets had to be made up directly from the engineered drawings. This is a feasible procedure for a small production rate with experienced personnel, but a tremendous job with today's plane complexity and inexperienced help.

Compiled in one volume, the planning layout series becomes a breakdown book of the complete airplane which serves not only Methods Planning, but Time-Study, Plant Layout and Equipment and Production Shop supervisors, as well. It's the full story for processing the over-all job.

▶ **Training Begun**—Republic's first training class started near the end of 1951, with only eight trainees. All had some sort of industrial background. The training phase was set up tentatively for a six-month period, with the idea of watching progress closely for future guidance.

It developed that four months of training was sufficient for this group to bring the men to the point where they

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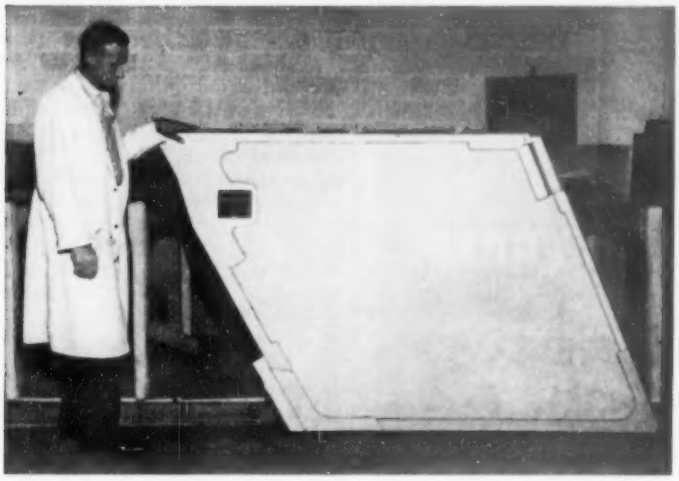

Shown above is a single curved wing panel used as a primary structure in a high performance Chance-Vought Aircraft jet. This type of construction is typical of Redux-bonded assemblies comprising metal-to-metal and metal to end-grain wood adhesive bonds.

Shown below is a section of a typical sandwich construction utilizing thick facings and end-grain wood core, bonded together with a structural adhesive. The internal doubler at the right illustrates how local reinforcements may be added and still retain flush contour.

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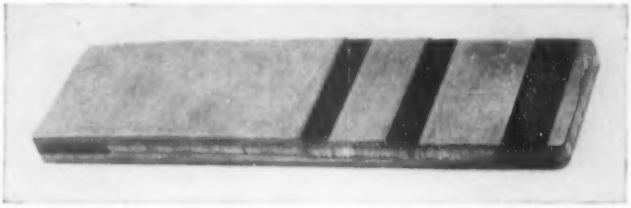

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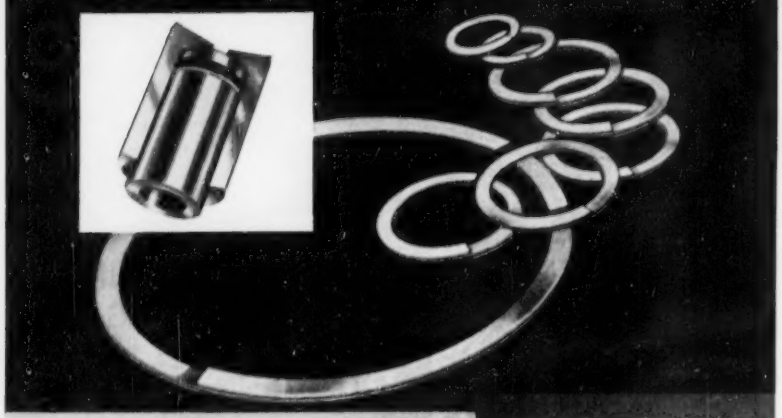

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could be brought into Processing for handling the simpler work, then progressing gradually.

From this point, the training program accelerated, with classes kept to about 10 trainees. Successive classes were started as employment fed new men into the plant, so that as many as four classes were held at one time.

The training course consisted of a general familiarization phase followed by time spent in all the manufacturing shops—tool, parts plant and machining, subassembly, and final assembly. Blueprint instruction was included, there was a small amount of work with practical mathematics, and study of Republic's engineering manual.

The last month of instruction consisted of performing regular processing jobs going on in the plant. These assignments were checked by Processing project supervisors and returned with comment. Instructors were experienced people from the Processing section.

The training program ended early this year, after about 70 men were trained. This seems a small return for all the effort—but there was no other way of getting these men with this amount of knowledge.

Meanwhile, other men were hired with continued outside solicitation and still others were "borrowed" from the Production shop. Total force in the over-all Manufacturing Methods activity now is 260 men.

► **Good Results**—Under the processing section head, there is a production liaison group which coordinates the work with the actual shop activity, initiating corrective action for production snags.

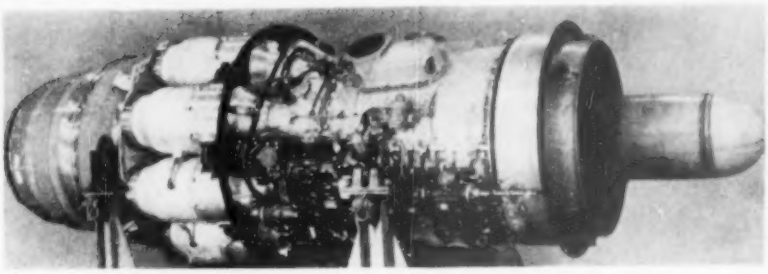
Because the two activities are so closely related, some of the trainee program graduates were transferred to Production Liaison to give them a closer look at another phase of manufacturing. Some of the early trainee graduates have been advanced to Tool Planning.

Republic has found that its training course has been more than justified. It has given a high level of talent in the Manufacturing Methods section. There have been good reports on trainee graduates in other phases of work to which they have been assigned.

It has frequently been shown that a trainee graduate fitted into the manufacturing scheme more quickly than another new man having experience in another plant, because the trainee was grounded from the beginning in Republic's methods.

Department heads acknowledge that the system of planning layout sheets has boosted the over-all efficiency not only of the newcomers but also of the various sections concerned with manufacturing.

The benefits realized have been so pronounced that Manufacturing Methods even is considering using the procedure for normal production periods.



AVON RA. 7 with 7,500 lb. thrust is now in production at Rolls-Royce plants.

New Avons Pass Military Tests

(McGraw-Hill World News)

London—Rolls-Royce has lowered the security just a bit on Britain's most heavily ordered jet engine, the Avon.

Rolls has let it be known that at least seven types of Avon jets have passed through the test houses at Derby or are being tested there now. Thrusts range from 6,000 lb. for the RA.2 to an undisclosed figure, probably in excess of 10,000 lb., for the RA.14. Specific weight figures range from 0.4 lb. thrust in the RA.2 to better than 0.3 lb. thrust in the later types.

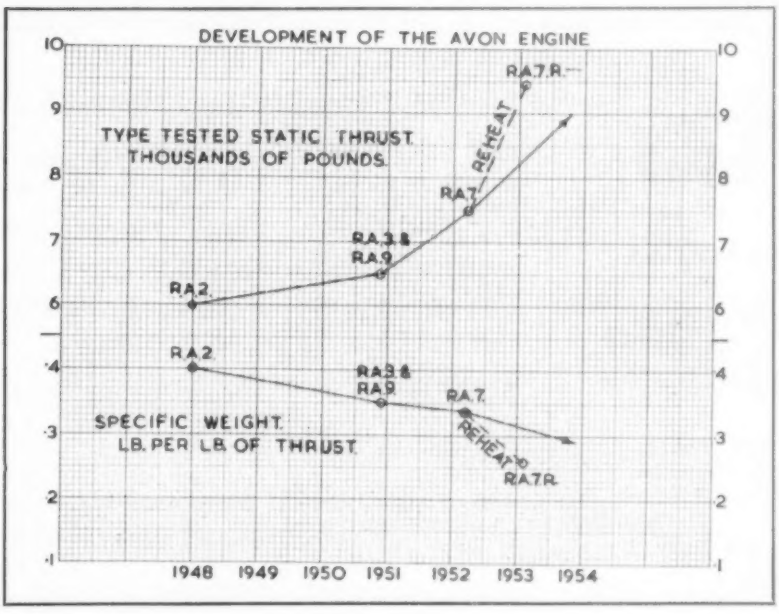
▶ **Afterburner Model**—Latest Avon to pass its 150-hr. military type test at Derby is the RA.7R (the RA.7 with afterburner). This engine has a gross rating of 9,500 lb., which, Rolls say, is "probably the highest figure at which any jet aero-engine has passed a military type test."

An English Electric Canberra, fitted with two afterburning Avons, appeared at Farnborough last fall. It is known that both the Hawker Hunter and the Vickers Supermarine Swift will be equipped for afterburning. Both the Swift, which is to come into service this June, and initial deliveries of the Hunter will be powered by Avons. (Most Hunters, however, will be powered by Armstrong-Siddeley Sapphire engines.)

Afterburning, says Rolls, "will almost halve the time to climb to the aircraft service ceiling for almost the same expenditure of fuel. It will very considerably raise the maximum altitude at which a fighter can operate." Speed is the thing, of course, and "the higher the speed, the greater the thrust boost," says Rolls. An afterburning system "which can provide 25% gain at takeoff conditions, will produce nearly 50% at 700 mph. and over 65% at 1,000 mph."

Afterburning must be limited to short duration, Rolls admits, since it pushes over-all fuel consumption much higher. But still, the company contends, "it remains the most economical means of thrust augmentation."

▶ **Five Producers**—Seven marks of RA.7 engines, thrust-rated at 7,500 lb. without afterburner, are now being produced



Vibration Engineering that solves your problems

PROBLEM: To achieve a high degree of vibration isolation in high powered engines.

SOLUTION: MB Pedestal Aircraft Mounts.

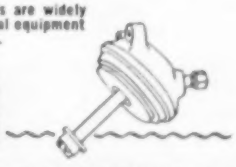
It's the flexible mountings – the only structural connection between engine and airframe – that absorb engine and propeller vibrations. Properly designed, they eliminate a great source of discomfort and protect the aircraft structure, accessories and instruments.

The MB Type 2770 Mount illustrated is an outstanding example of a properly designed mount. Service records confirm both its performance and durability. An *aluminum* unit, it also saves about 60 pounds per engine. These mounts are used for original and replacement installations on Pratt and Whitney engines.

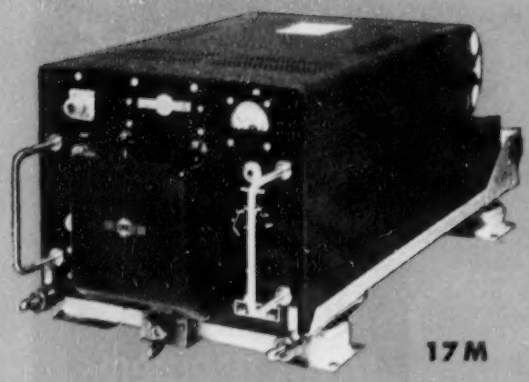
Remember – MB products are available to help you on all phases of vibration problems . . . including shake testing, detection, measurement and control. That's why so many companies make MB their *headquarters* for vibration engineering.

*Reg. U.S. Pat. Off.

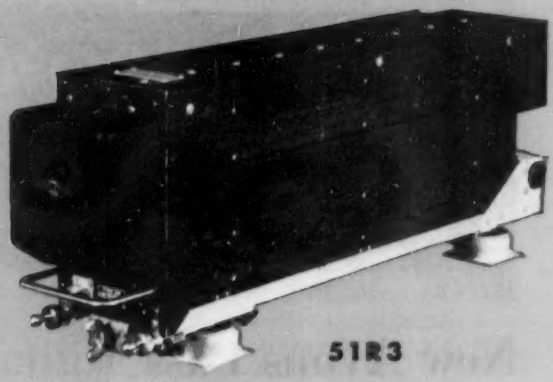
Pedestal MB Mounts are widely used both as original equipment and as replacement.



THE MB MANUFACTURING COMPANY, Inc.
1067 State Street, New Haven 11, Conn.



17M



51R3

17M 360-CHANNEL VHF AIRBORNE TRANSMITTER — Introducing another Collins quality product in the aviation field: 17M VHF Transmitter. Full 360 channels in the frequency range of 118.0-135.9 megacycles. 50 watt power output with phone emission. Meets ARINC Spec. #520.

51X 360-CHANNEL VHF AIRBORNE COMMUNICATIONS RECEIVER — Companion to 17M Transmitter. Complete new design to meet ARINC Spec. #520 for 50 kc bandwidth. Same famous Collins fingertip remote control circuitry as used for 51R receiver and adopted as standard by airborne equipment industry. The Collins 51X has the sensitivity, selectivity and spurious response rejection characteristics required for flight and airport traffic control.

51R-3 AIRBORNE NAVIGATION RECEIVER — Here is the receiver that fulfills the navigation and communication receiving requirements of all types of military, commercial, and private aircraft using the 108 to 136 megacycle band. (The 51R-3 provides for omnirange, localizer for instrument landing and communication reception.) Channel selector for the equipment is arranged to accommodate the addition of a glide slope receiver and distance measuring equipment. Thus, choice of appropriate localizer and glide slope channels is afforded from a single control unit. The 51R-3 Receiver is engineered to provide the ultimate in accuracy and dependability in all types of aircraft.

a COLLINS report on AVIATION RADIO

6185

18S-4

180L-2

OTHER PROVEN PRODUCTS FROM COLLINS ELECTRONIC RESEARCH

618S 144-CHANNEL HF TRANSCEIVER — Airline transmitting-receiving equipment with 100 watt power output on 144 crystal controlled channels. Automatically tuned elements insure maximum flexibility and high power output.

18S-4 10-CHANNEL — 20-FREQUENCY TRANSCEIVER — Transmitter-receiver for commercial or executive aircraft. Frequency range of 2.0 to 18.5 megacycles. One hundred watt power output.

180L-2 AUTOMATIC ANTENNA TUNING UNIT — Automatically matches 18S or 618S output to aircraft antenna.

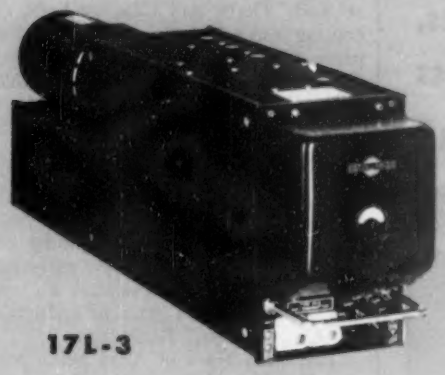
COLLINS PRECISION TEST EQUIPMENT

478B GLIDE SLOPE SIGNAL GENERATOR — This unit provides crystal controlled test signals for bench-testing Glide Slope Receivers in the band 329.3 to 335.0 mc.

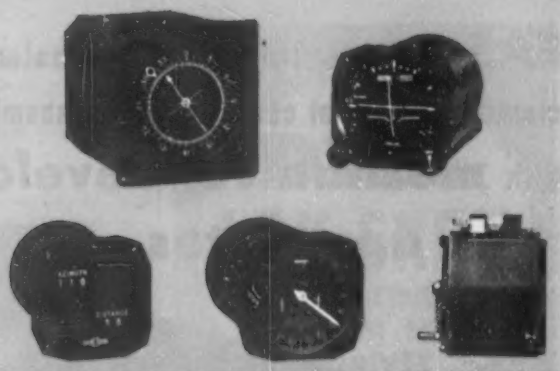
478C IFS TEST EQUIPMENT — Bench tester for Collins IFS Computer, automatic pilots and other flight director equipments.

479T-2 SIGNAL GENERATOR — This is precise ramp-test equipment for airborne VOR localizer and glide slope receivers.

479S-3 AUDIO SIGNAL GENERATOR — Generator is used in precision bench testing omni-range, localizer and glide slope receivers. Output signals for VOR, localizer, and glide slope audio circuit investigations are provided.



17L-3



COLLINS INTEGRATED FLIGHT SYSTEM AND NAVIGATION COMPUTER

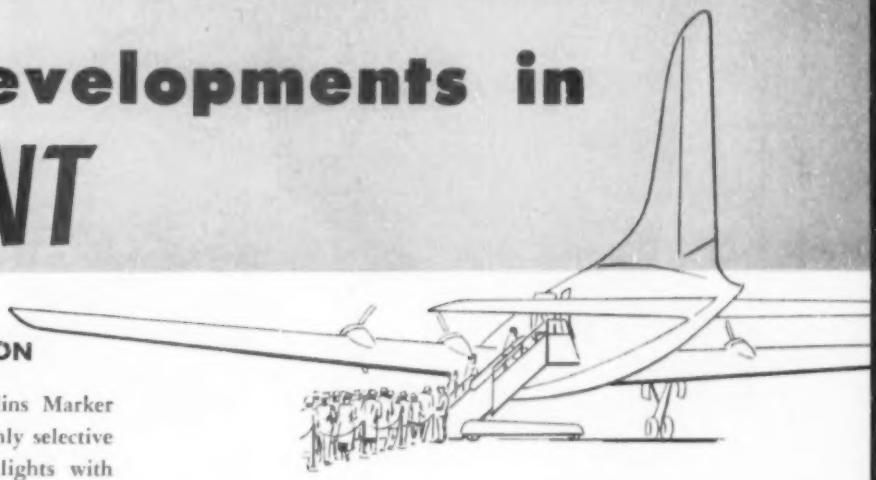
17L-3 180-CHANNEL VHF AIRBORNE TRANSMITTER — Frequency range is 118.0 to 135.9 megacycles, and all 180 channels are easily selected on a simple, positive remote control system. Power output is conservatively rated at 8 watts. Hundreds of these dependable transmitters are now furnishing consistently reliable service.

17L-4 360-CHANNEL VHF AIRBORNE TRANSMITTER — Transmitting facilities are provided on all channels reserved for aircraft communication in the VHF band. Ease of operation and dependability are the same as the Collins 17L-3, but power output is increased to approximately 25 watts and 50 kc channel spacing is provided.

INTEGRATED FLIGHT SYSTEM — Simplifies ILS approaches by presenting precisely computed steering information in conjunction with simplified pictorial type instruments. Instrumentation also simplifies enroute navigation.

NAVIGATION COMPUTER — The Collins NC-101 Navigation System provides the pilot continuous position information. Required data is fed into the electronic computer on a previously prepared punch card. Punch card then activates the Computer, giving the pilot a continuous fix measured in miles from his destination along a chosen course.

electronic developments in EQUIPMENT



NEW AVIATION AIDS IN PRODUCTION

51Z-1 MARKER BEACON RECEIVER — Collins Marker Beacon Receiver is completely dependable, highly selective and free from spurious response. Operates lights with minimum "twilight" indication.

51V-2 GLIDE SLOPE RECEIVER — The 51V-2 is designed for reception of 90/150 cps tone modulated glide slope signals on any of the twenty channels in the UHF range of 329.3 to 335.0 megacycles.

Collins designs and manufactures a complete line of radio communications equipment for the aeronautical services. Your inquiries are welcome and we suggest you investigate such new developments as Collins TVOR and microwave for airlines. Please specify the type of descriptive literature desired.

FOR AVIATION RADIO ADVANCEMENTS, IT'S . . .

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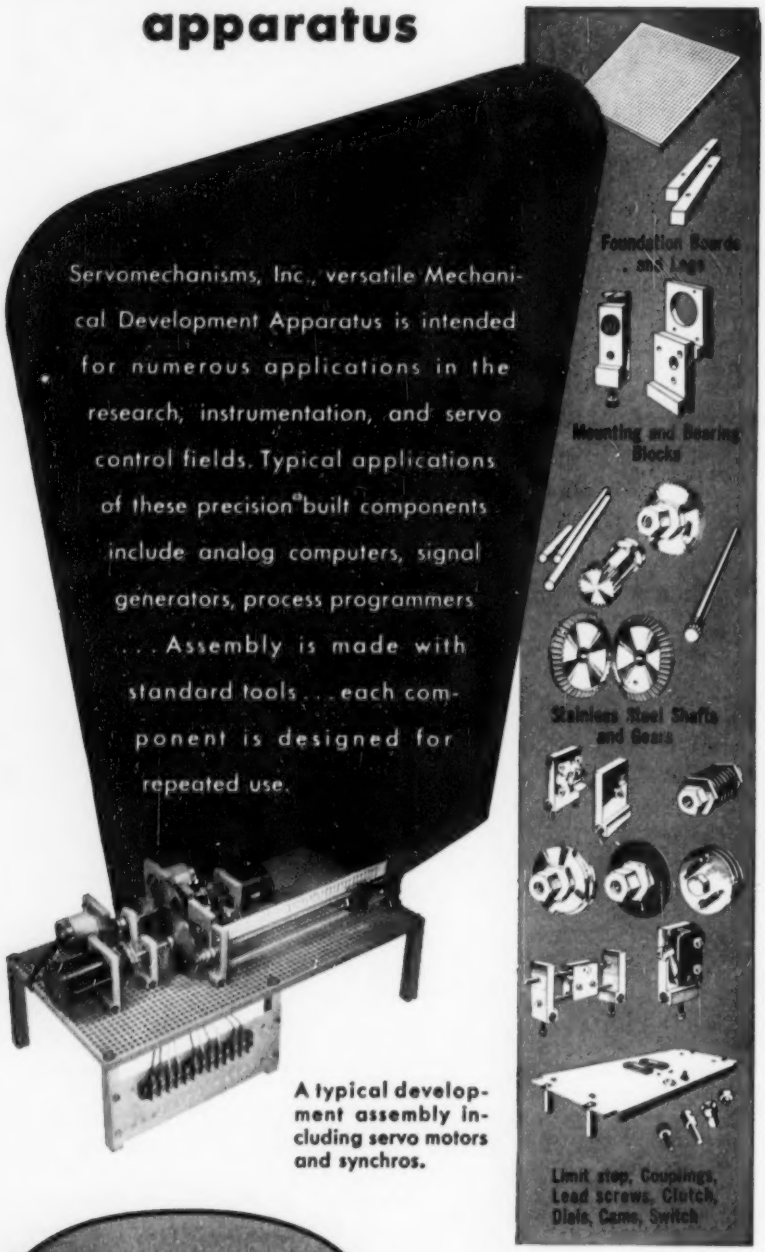
Servomechanisms, Inc., versatile Mechanical Development Apparatus is intended for numerous applications in the research, instrumentation, and servo control fields. Typical applications of these precision-built components include analog computers, signal generators, process programmers . . . Assembly is made with standard tools . . . each component is designed for repeated use.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at Rolls' Derby and Glasgow lines, or coming into production at Bristol Aeroplane Co., Ltd., or Standard Motors Co., Ltd., Coventry. A fifth production line will be started at a new plant, run by D. Napier & Sons, Bootle, Lancashire.

The RA.7 is likely to be the powerplant for F-86E Sabres and English Electric Canberras produced in Australia. Marks of the RA.7 coming off the lines now will incorporate anti-icing provisions. This "is essential for engines having such a mass air consumption as the Avon," Rolls says.

The other types of Avon being produced at this date are the RA.3 and its civil version, the RA. 9, both thrust-rated at 6,500 lb. The RA.9 is the powerplant for the Comet 2. Initial deliveries of the Canberra were powered by the military RA.3.

► **New Big Ones**—No details are available of Rolls' latest acknowledged Avons, the RA.14 and "a civil engine of 9,000 lb. thrust." This latter engine, AVIATION WEEK was told last fall, will be known as the RA.16 and will power the Comet 3. In light of the fact that de Havilland is following a very conservative policy of powering its Comets with de-rated jet engines—that is engines rated below their maximum possible thrust—it is fair to assume that the RA.14 will exceed 10,000-lb. thrust in service.

It is also assumed that the Vickers Valiant four-jet bomber will be the first service aircraft to use the RA.14.

On the specific weight side, Rolls points out, "although total weight has been increased on the RA.7 engine as a result of strengthening to meet the loads imposed at sonic speeds on fighter aircraft, the thrust/weight ratio has continued to improve." —NMcK

PRODUCTION BRIEFING

► **Bill Jack Scientific Instrument Co.,** Solana Beach, Calif., has received three additional USAF contracts for development of high-altitude pressurized helmets, miniaturized electronic camera controls and precision intervalometers.

► **Solar Aircraft Co.,** San Diego, Calif., has been awarded more than $500,000 in contracts from Convair. One award covers design and manufacture of several hundred T-29 Solaramic-coated exhaust systems; another contract is for construction of T-29 and Convair-Liner exhaust augmentors.

► **Standard Pressed Steel Co.,** Jenkintown, Pa., is completing a $10-million machinery and new-plant expansion program which will place more than 650,-

000 sq. ft. of integrated floor space under one roof. The firm makes fasteners, aircraft specialty parts and shop equipment.

▶ **Lockheed Aircraft Corp.** has started work on a $3-million enlargement of facilities at Burbank, Calif., to expand output of multi-engine military aircraft. Completion is scheduled for early 1954.

▶ **American Standard Products Co.,** Hartford, Conn., has completed a 21,000-sq. ft. building in this city for production of precision screws for jet engines. The firm employs 200.

▶ **Convair-Ft. Worth** set a new safety record in 1952—time lost from on-the-job injuries last year was approximately one-fifth of one day for each employe. Disability injury rate was 1.5 per million man-hours worked.

▶ **Permatex Co., Inc.,** Brooklyn, N. Y., has completed rearrangement and expansion of its warehousing facilities to insure faster service on its line of aviation maintenance chemicals. Under the new set-up, the firm has warehouses in Cleveland, San Francisco, St. Louis, Dallas, Chicago, Portland, Ore., Los Angeles, Charlotte, Detroit, Atlanta and New York.

Excellent Positions Now Available

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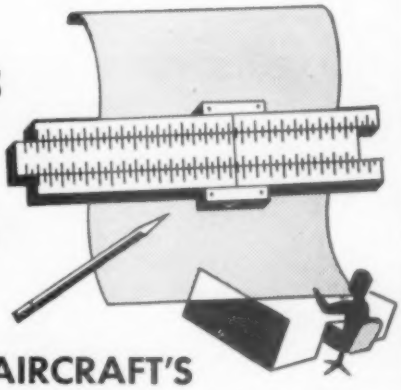

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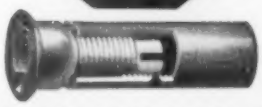
DILL
LOK-SKRU
THE BLIND ANCHOR NUT OR/RIVET

ONE MAN INSTALLATION IN SECONDS



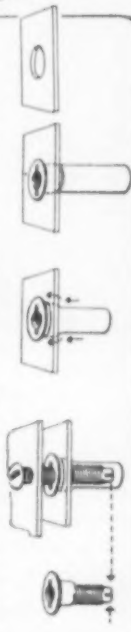
THE AVIATION STANDARD
for Screw Locking Anchor Nut Uses and Metal to Metal Fastening.

1 Drill one (1) hole.

2 Insert Lok-Skru with either Hand or Power Lok-Skru Tool.

3 With Lok-Skru Tool draw barrel over shoulder of Lok-Skru and flush with metal. This provides a Blind Anchor Nut for Secondary Attachments.

4 TO FASTEN ATTACHMENTS insert standard Machine Screw through hole in attachment and into Lok-Skru. As machine screw is tightened into Lok-Skru it is securely locked by means of the "Specially Crimped" locking-end of the Lok-Skru.



Crimped internal threads of Lok-Skru provide secure locking device for attachment screw.

Write for Folder
Handy information on the many uses and application of Lok-Skrus in airplane construction with complete data on types and sizes.

THE **DILL** MANUFACTURING CO.

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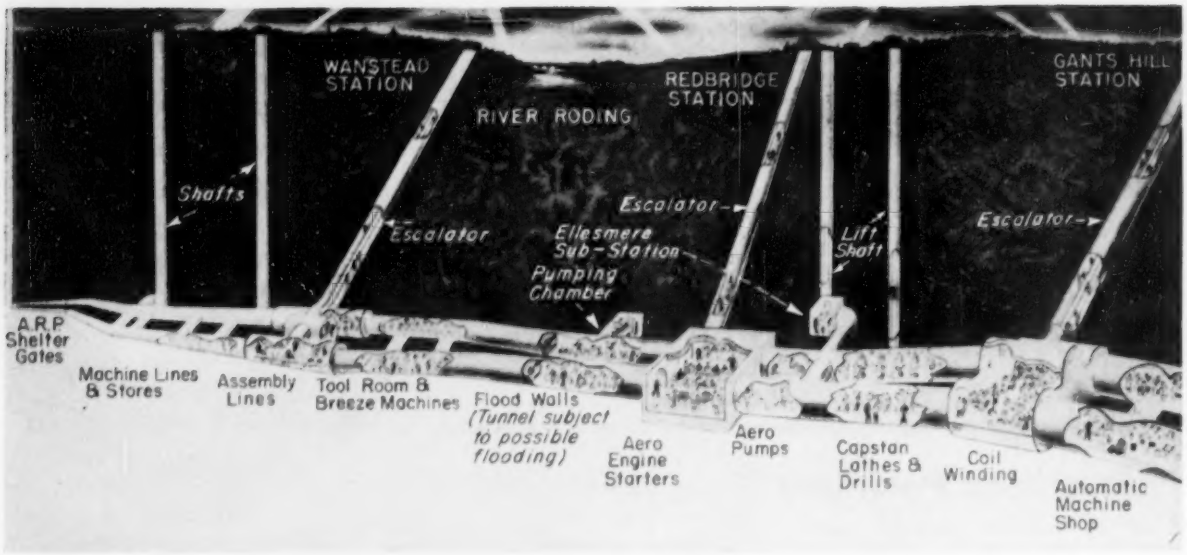
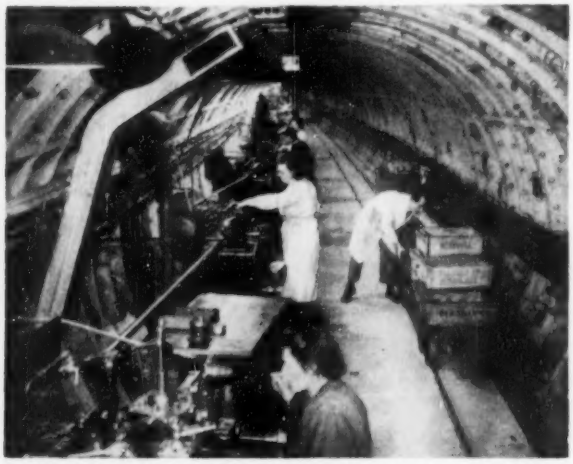


MACHINES in wartime underground aircraft plant were fed by . . .



NARROW GAUGE railway linking shops and assembly lines.

How Plessey Plant Escaped Buzz Bombs

These photos and the drawing at the top of the page illustrate one approach to the problem of making important factories bomb-proof. During World War II, after the Nazis had bombed out the Plessey company's plant, the firm moved its operations into a near-completed section of the London subway system. There, safe from buzz bombs, the Ilford, Essex, company carried on operations through the remainder of the war with its predominantly female work force. An electric-powered railroad ran on narrow-gauge tracks through the tunnel to feed the machines and take away finished goods.

The photos shown on this page were obtained recently from Pesco Products, Bedford, Ohio, whose pumps were among the items made by Plessey in the underground factory.

AIRCRAFT PUMPS were put together in assembly shop housed in a subway station.

YOU WOULDN'T KNOW AN ENGINE WAS RUNNING 300 FEET AWAY FROM THIS RAM JET STAND

UNITED AIRCRAFT in East Hartford runs this laboratory for ram jet testing so quietly that its operation can scarcely be heard at a distance of 100 yards. Maxim Silencers, 19 in all, effectively silence exhaust and intake of engines, compressors, and ram jet exhaust. For the solution to unusual silencing problems, consult Maxim, the company unequalled in silencing experience.

Consult **MAXIM**

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Gentlemen: Please send me more information on jet engine silencing.

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LOCKHEED "STARFIRE" SCORES WITH *Conditioned Brain Waves*

For split-second, precision operation of her radar-tracking and electronic automatic firing equipment, a high altitude all-weather interceptor must have constant pressure in her wave guides. These channels of communications between "brain" and equipment must remain properly conditioned for transmission of intelligence—a vital task performed by the Lear-Romec Pressurizing Pump illustrated.

As this jet tracks her target at supersonic speed, fresh oil-and-moisture-free air must be pumped into wave guides to maintain constant sea level pressure regardless of altitude. Originally developed for the Lockheed F-94C, the Lear-Romec Oil-less Pressurizing Pump illustrated does the job. Graphitar blades and bearings eliminate the need for lubrication, air supply is kept free of moisture by a dehydrator, and automatic maintenance of pressure is assured by an absolute pressure switch.

This and other types of pressurizing equipment made by Lear-Romec are now installed on almost every size and type of high altitude military plane using antenna wave guides and transducers.

Many new and highly specialized components for aircraft fluid systems are now available from Lear-Romec. For detailed information write for the new Lear-Romec catalog.

RG-9065 PRESSURIZING PUMP— positive displacement, rotary vane, supplies oil-free air to aircraft electronic installations to prevent arcing of hf current. ¼ h.p., 4300 r.p.m., wt. 9.3 lbs. max.

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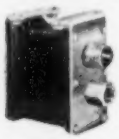
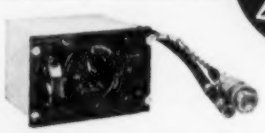
Advancing the Frontiers of Flight



ABSOLUTE PRESSURE SWITCHES



RADAR PRESSURIZING CONTROL PANELS

LEAR-ROMEC DIVISION

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•

LEARCAL DIVISION, LOS ANGELES, CALIFORNIA
LEAR, INCORPORATED, GRAND RAPIDS 2, MICHIGAN
GRAND RAPIDS DIVISION, GRAND RAPIDS 2, MICHIGAN

OTHER LEAR-ROMEC PRODUCTS: WATER INJECTION PUMPS • FUEL FILTER DE-ICER PUMPS
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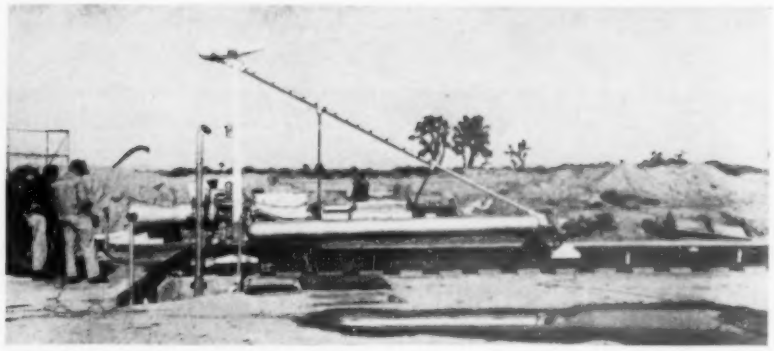
AIRBORNE AIR COMPRESSORS • CENTRIFUGAL AND TURBINE PUMPS • CAMERA VACUUM PUMPS



STREAMLINED FAIRING on vertical member houses parachute to be tested on rocket sled rig in design studies being conducted at Edwards AFB.

Rocket Engine Design Advances

A valuable clue to the state of the rocket motor development art has been provided by North American Aviation, Inc. in the photo of a liquid-propellant motor built by NAA for a highspeed test sled at Edwards AFB.

Judging by the photo, the motor has an overall length of about four feet and an exit diameter of about two feet. NAA says that the engine uses liquid oxygen and alcohol to generate 50,000 lb. of thrust.

This motor represents about a one-third size reduction from the German V-2 engine, designed to operate with the same propellants and at about the same thrust.

The maker says that the engine can be adapted readily to assist aircraft takeoffs from runways or carriers.

▶ **Like Free Flight**—North American's engine powers a test sled over a 10,000-ft. stretch of rails in the desert at Edwards AFB. The idea of the sled is to make tests which are equivalent to free flight, except that the flight path is exactly predictable and the conditions of the flight can be controlled more carefully.

The big rocket engine accelerates the sled from zero to Mach 2 in a matter of four or five seconds, taking over half the track length to do so. North American says that the cost of a test run with the lox-alcohol powerplant is only about $100 compared to $5,000 for an equivalent test with solid-propellant engine.

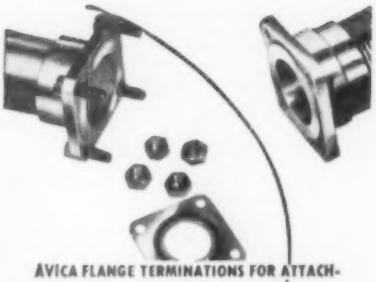
Near the top of the job list for the facility is a series of parachute design studies being made by Cook Research Laboratories, the division of Cook Electric Co. which built the sled.

Fast Writeoffs

Accelerated tax amortization for manufacturers expanding their defense facilities is granted by the government in the form of certificates of necessity.

In the following list of recent certificates, company name is given, followed by product or service, cost of construction deemed necessary for defense expansion, and the percentage of the expansion cost allowed for fast write-off. Fast writeoff permits property to be depreciated in five years.

- **Bowden Mfg. Corp.**, Cleveland, aircraft parts, $9,585, 70%.
- **Hays Manufacturing Co.**, Columbus, Ohio, machining of aircraft parts, $5,870, 70%.
- **M. C. Manufacturing Co.**, Lake Orion, Mich., aircraft components, $48,145, 70%.
- **Marquette Metal Prod. Co.**, Cleveland, aircraft parts, $25,152, 65%.
- **Maks Machine Co.**, Warren Tnshp., Macomb Co., Mich., aircraft parts, $38,245, 70%.
- **Bendix Aviation Corp.**, Hamilton, Ohio, aircraft parts, $20,347, 50%.
- **Ex-Cell-O Corp.**, Highland Park, Mich., aircraft parts, $43,400, 65%.
- **Kiekhaefer Aeromarine Motors, Inc.**, Oshkosh, Wis., aircraft components, $95,130, 40%.
- **Perfex Corp.**, Milwaukee, aircraft parts, $4,556, 70%.
- **John Oster Mfg. Co.**, Racine, Wis., aircraft parts, $164,474, 65%.
- **McKee Door Co.**, Aurora, Ill., components for aircraft hangars, $149,829, 50%.
- **Boeing Airplane Co.**, Wichita, aircraft & aircraft parts, $48,616, 65%.
- **Western Supplies Co.**, St. Louis, ordnance and aircraft parts, $22,074, 65%.
- **Westholt Mfg. Co.**, Wichita, aircraft parts, $53,647, 70%.
- **McLean Development Laboratories, Inc.**, Dallas, aircraft parts, $21,226, 70%.
- **Modglin Co., Inc.**, Los Angeles, aircraft parts, $85,000, 45%.
- **Mars Engineering & Mfg. Co.**, Burbank, Calif., aircraft parts, $175,716, 65%; $161,263, 65%.
- **Witteman Co.**, Alhambra, Calif., machining of aircraft parts, $39,445, 70%.
- **Lockheed Aircraft Corp.**, Burbank, Calif., aircraft parts, $90,861, 65%.
- **Hydraulic Research & Manufacturing Co.**, Burbank, Calif., aircraft parts, $22,889, 70%.
- **Emsco Mfg. Co.**, Los Angeles, aircraft parts, $12,614, 65%.
- **Neuschotz Eng. Co.**, Los Angeles, aircraft parts, $23,004, 70%.
- **Certified Mfg. Co.**, Seattle, machining of aircraft parts, $10,941, 70%.
- **Ravenna Metal Products Corp.**, Seattle, aircraft & ordnance, $24,721, 70%.
- **General Electric Co.**, Schenectady, N. Y., aircraft parts, $1,039,940, 50%.
- **American Machine & Foundry Co.**, ordnance and aircraft parts, Brooklyn, $55,120, 65%.



AVICA FLANGE TERMINATIONS FOR ATTACHING RIGID TUBING TO A FLEXIBLE EXPANSION JOINT

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MECHANICALLY ATTACHED TUBE FITTINGS IN CORROSION RESISTANT STAINLESS STEEL OR ALUMINUM ALLOY

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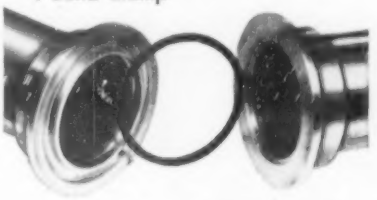
AVICA Tube Fittings can be Engineered for any Aircraft; Power Plant; Missile or Industrial application. Terminations to AN standards or to customers special requirements such as flanges shown with O Ring Groove to suit V-Band Clamp



FLANGES TO SUIT V-BAND CLAMPS

TECHNICAL DATA . . . Write for full Technical Data on AVICA Mechanically Attached Tube Fittings, Mock-up Fittings and Assembly Tools

WRITE TO SPECIAL PROJECTS DEPT. A. W.

AVICA CORPORATION
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• **Curtiss-Wright Corp.**, Carlstadt, N. J., aircraft parts, $19,182, 65%.
• **Lord Mfg. Co.**, Erie, Pa., aircraft parts, $82,287, 65%.
• **Glenn L. Martin Co.**, Middle River, Md., aircraft parts, $59,556, 65%.
• **Wright Machinery Co.**, Durham, N. C., aircraft parts, $196,918, 65%.
• **Durham Mfg. Co.**, Cincinnati, ordnance and aircraft parts, $66,000, 55%.
• **Seren Tool & Mfg. Co.**, Chicago, machining of ordnance and aircraft parts, $28,765, 70%.
• **Helwig Tool Mfg. Co., Inc.**, St. Paul, aircraft and ordnance parts, $18,177, 70%.
• **Boyt Harness Co.**, Des Moines, aircraft and ordnance parts, $67,761, 55%.
• **Nesker Bros. Iron Co.**, Robertson, Mo., aircraft landing mats, $410,331, 65%.
• **Goodyear Aircraft Corp.**, Litchfield Park, Ariz., airship and aircraft parts, $123,781, 65%.
• **Lockheed Aircraft Corp.**, Burbank, Calif., aircraft and aircraft parts, $92,460, 60%; aircraft parts, $62,257, 65%.

Navy Contracts

The following contracts were announced recently by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11.

Kidde & Co., Inc., Walter, 675 Main St., Belleville, N. J., oxygen recharge equip., electric motor driven, 18 each, $70,245.

Szekely and Associates, Inc., O. E., 5312 Westminster Ave., Philadelphia 31, parts, spindle assys., $33,494.

American Phenolic Co., 1830 S. 54th St., Chicago 50, receptacles and plugs for general aircraft, $64,624.

McDonnell Aircraft Corp., P. O. Box 516, St. Louis 3, control assembly; spare parts for F2H-2 and F2H-2P aircraft, 82 each, $36,678.

Martin Co., Glenn L., Baltimore, parts, maintenance for P4M aircraft, $30,107.

Loew Brothers Co., 424 E. Third St., Dayton 2, lacquer, camouflage, $100,382; lacquer, cellulose nitrate clear, 45,515 gal., $85,168.

Manning, Maxwell and Moore, Inc., 250 East Main St., Stratford, Conn., valve assembly; for F9F-2, -2B, -2P, -3, -4, -5, -5P, -6, -6P, -7, AF-2S, -2W aircraft, 755 each, $107,833.

Aerotherm Corp., Bantam, Conn., seat assy., double passenger, for R4D-5, -6 (all) aircraft, 200 each, $82,600.

Cook Paint & Varnish, 1412 Knox St., North Kansas City, Mo., lacquer, glass, pigmented, 47,760 gal., $34,148.

Aero Equipment Corp., Enterprise & Trevitt Sts., Bryan, Ohio, maintenance parts; frame, vane, gasket, $50,901.

Schuttig and Co., Inc., 9th & Kearny Sts., N.E., Washington 17, D. C., relay, used in AN/ARC-1 equipment, 1,500 ea., $30,150.

American Steel & Wire Div., United States Steel Corp., 1617 Pennsylvania Blvd., Philadelphia 3, wire, steel, 38,000 lb., $54,351.

Senn, Inc., George, 2200 E. Westmoreland, Philadelphia 34, thinner, 30,000 gal., $32,520.

AiResearch Mfg. Co., div. of the Garrett Corp., 9851-9951 Sepulveda Blvd., regulators, exchanger assys., etc. for various aircraft, $1,764,221.

Aerial Machine & Tool, 38-27 30th St., Long Island City 1, N. Y., pilot's safety belt, lap part, 9,060 ea., $73,386.

United States Gauge Div., American Machine & Metal, Inc., Clymer Ave., Sellersville, Pa., pressure gauge, 7,987 ea., $61,819.

Stein Brothers Mfg. Co., 1401 W. Jackson Blvd., Chicago 7, pilot's safety belt, shoulder strap, 48,812 ea., $8,890.

French Mfg. Co., 15 Union St., Worcester, Mass., paulin, rubber-coated, 18,550 ea., $254,995.

United States Rubber, 10 Eagle St., Providence, R. I., cases, watertight, $155,713.

Brooklyn Paint & Varnish Co., Inc., 50 Jay St., Brooklyn 1, varnish, $50,704.

Electric Auto-Lite Co., 1201 Champlain St., Toledo 1, spark plugs, 217,995 ea., $265,899.

Aerotec Corp., Comly Ave. & Pemberwick Rd., Greenwich, Conn., valve assys., $224,290.

Marvel Mfg., P. O. Box 335, Caldwell, N. J., tools, $188,969.

Titeflex, Inc., 500 Freilinghuysen Ave., Newark, N. J., conduit, 11,750 ft., $72,992.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., switches, transmitters and unit, $45,362.

Wycoff Steel Co., P. O. Box 1256, Pittsburgh 30, steel, chrome-molybdenum, $44,446.

Aerol Co., Inc., 2424 San Fernando Rd., Los Angeles 65, wheel assy., 2,687 each, $113,065.

Simmonds Aerocessories, Inc., 105 White Plains Rd., Tarrytown, N. Y., amplifiers and calibrators, $88,290.

Red Bank Div., Bendix Aviation Corp., Eatontown, N. J., inverter, 97 each, $80,347.

Douglas Aircraft Co., Inc., El Segundo, Calif., maintenance for AD aircraft, $26,375.

Superior Paint and Lacquer Works, 6231 Maywood Ave., P. O. Box 271, Huntington Park, Calif., paint, $68,207.

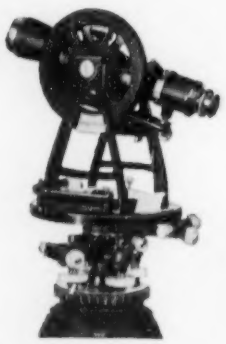
Pacific Paint & Varnish Co., 4th and Cedar Sts., Berkeley 10, Calif., paint, $91,161.

Eicor Inc., 1501 W. Congress St., Chicago 7, inverters, component spare parts, 12,243 ea., $1,188,238.

Elgeet Optical Co., 838 Smith St., Rochester, N. Y., lens, photographic, 1,660 ea., $59,262.

Aerial Cameras

General Electric Co.'s X-Ray Dept., Milwaukee 14, has been awarded a $2.2-million aerial camera contract by USAF. The new award raises the department's military contracts total to $5-million and will make it necessary to increase the present working force from 150 to 200.



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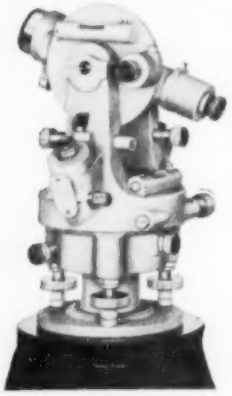

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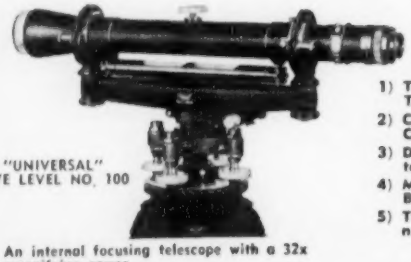
The most accurate and quickly read transit in the world.



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WYE LEVEL NO. 100
An internal focusing telescope with a 32x magnifying power.

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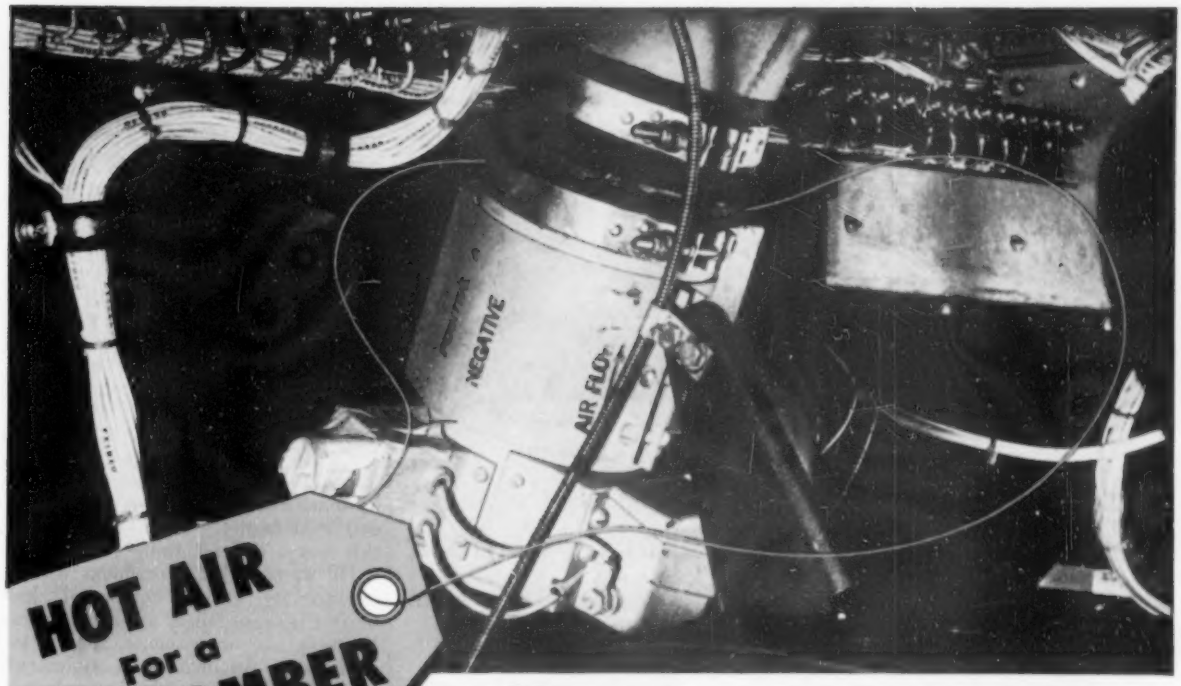
2) Crofoot, Nielsen & Co., 205 Wacker Drive, Chicago 6, Ill.
3) D & W Blue Print Co.,16 Perry Street, Trenton, New Jersey
4) Modern Blue Print Co., 47-51 Cornhill, Boston, Mass.
5) The Ostermann Co., 2222 Woodward Avenue, Detroit 1, Mich.

AND OTHERS

"NITAC" LEVEL NO. 24
The only level of its kind with split bubble, erect image, visible through direct line of sight.



HOT AIR For a HOT BOMBER from JOY AXIVANE® AIRCRAFT FANS

The Boeing B-47 travels at altitudes where the temperature is somewhat less than balmy. Since the cabin is pressurized, the pilot wears no mask. Unless prevented, the moisture in his breath would quickly condense and freeze on the plexiglass windshield and canopy leaving him with no vision at all.

Boeing engineers installed a Joy AXIVANE aircraft fan, with integral heating unit, behind the instrument panel. Hot, dry air, blown through a Y-duct to both sides of the windshield, prevents frost at any altitude. It also eliminates the forming of windshield fog upon rapid descent into warm air.

This AXIVANE fan, standard on all B-47 bombers, is only 3½" in diameter and 6¾" long, and weighs a scant 5 pounds, yet it produces 60 CFM at 5" W.G. Heater rating is 1500 watts at 27 volts. For safety, the heating element is thermostatically protected. A & N design specifications throughout.

● Joy designs and builds each fan to the exact requirements for which it is intended. Each fan, therefore, is custom-engineered for highest efficiency. For many purposes stock fans can be supplied from the extensive line already designed. Both single and two-stage units available. Optional features include straight or flared inlets, beaded or flanged connections, radio noise-filters, anodization, and cooled motors where required.

★ ★ ★ ★ ★

Here are some of the many uses for Joy AXIVANE Aircraft Fans: Windshield de-frosting, windshield or wing de-icing, cabin heating, cabin ventilating, cockpit heating, cooling radio and electronic equipment, cooling voltage regulators, oil cooling, gear-box cooling, instrument cooling, air recirculation, and high-altitude pressurizer boosting.

Write for Bulletin, or

Consult a Joy Engineer

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BOMBING ACCURACY has improved as operator's task has been simplified.

AIEE Engineers Told:

Don't Overlook the Human Factor

Psychological approach can help pinpoint weakness in design: equipment must be good, but easy to use.

By Philip Klass

Growing complexity of aircraft and their avionics equipment reflects the more difficult demands of modern warfare, but it need present no serious problem if equipment is made more reliable. However, it does demand increased application of "human engineering" principles to make equipment easier to use.

That is what engineers were told who attended the session on Complexity in Electronics Equipment during the recent American Institute of Electrical Engineers convention in New York.

▶ **Reliability**—On the sister-subject of reliability, the seven speakers, representing several military agencies, a manufacturer, a research lab, and a psychological design consulting firm, reported that:

- **Psychologists can help** engineers decide whether added complexity is justified by improved performance.
- **Complexity and unreliability** are not necessarily synonymous.
- **GE's new ASR-2 radar** is extremely reliable despite its complexity.
- **More emphasis and money** must be diverted from research into engineering and testing to improve reliability.
- **Misapplication of vacuum tubes** by design engineers is a major cause of electronic equipment failure.

The AIEE audience also got a look at a set of curves which, in a qualitative way, showed the growth in accuracy, complexity, and reliability of USAF bombing systems during the past decade. The equipment was not specifically identified as bombing systems, but very little deduction was needed to identify it as such. (Chart on p. 55.)

▶ **Trend to Automaticity**—"Automaticity is needed to perform the more complex job involved in modern warfare," according to Lt Col. J. C. Dieffenderfer, chief of the electrical branch at the USAF's Wright Air Development Center (WADC) in Dayton.

Design Challenge

"It is in systems engineering in complex electronics systems work that the real challenge to the present-day young engineer lies," according to R. J. Nordlund of the Wright Air Development Center's armament laboratory in Dayton.

"It is work that does not appeal to the type of person that desires to specialize and acquire a great store of knowledge about some distinct and unique portion of the field. Nor does it continue for long to appeal to the type of individual who likes his days to be serene and his nights untroubled. It is difficult work, but unbelievably rewarding in a sense of real accomplishment and service to his fellow man.

"The young man who is fortunate enough to get in on the conception of a systems project, and can stay with it through the many years which are the average span of development of such a project, emerges with a mature sense of his own capabilities and is usually then equipped to engage in technical administration work. Systems engineering work is the most broadening of any phase of the profession and is a liberal education in itself."

Dieffenderfer delivered a paper written by R. J. Nordlund of WADC's armament laboratory, adding a few of his own views to those contained in Nordlund's paper. Another reason for automaticity, Dieffenderfer said, is that "man doesn't think too well during combat."

E. L. Nelson of the Signal Corps Engineering labs justified automaticity on the basis that it reduces the time needed to train equipment operators and that it cuts the chance for making human errors. Nelson predicted that the number of avionics equipments and their complexity would grow in the future because this is our only hope of counter-balancing the enemy's larger supply of manpower.

Nelson urged designers to ask themselves: "Is the complexity of this equipment or this feature justified by its end contribution?" But he admitted this was a difficult thing to evaluate.

He warned that superfluous use of automaticity makes equipment less flexible because failure of an automatic function can incapacitate the entire equipment. An increase in equipment automaticity, with its added complexity, must therefore be accompanied by an increase in reliability, Nelson warned.

▶ **Complexity vs. Reliability**—"Complexity (of avionics equipment) is not important if we have reliability," Col. Dieffenderfer said. "If a 'black box' performs its function day after day, never requiring disassembly or attention, it is a simple gadget (to the user), regardless of the wondrous jumble of tubes, capacitors, resistors and whatnot which may be hidden inside," Nordlund's paper said.

As proof that complexity and unreliability need not be synonomous Nordlund cited the telephone, which appears to be a "simple" device because it is reliable and easy to use. Behind this apparent simplicity, Nordlund said, lies an extremely complex automatic exchange.

▶ **More Proof**—The new ASR-2 surveillance radar, which General Electric is building for CAA, was offered as further evidence that electronic equipment reliability can be extremely good if cautious design is used. According to T. I. Paganelli of GE, the ASR-2s have required an average of only two hours "down time" for every hundred hours of use, despite the fact that each ASR-2 uses some 500 vacuum tubes.

GE has experienced no component failures other than vacuum tubes in its ASR-2s to date, Paganelli said. One explanation for this is that CAA specifications require a 50% derating of standard JAN-rated components, i.e. a two-watt JAN-rated resistor is used as only a one-watt resistor in the ASR-2.

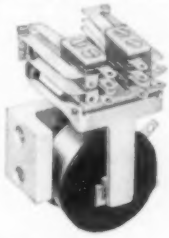
The widespread use of circuit fusing in the ASR-2 was also credited by Paga-

POTTER & BRUMFIELD LEADS IN RELAY DEVELOPMENT & PRODUCTION

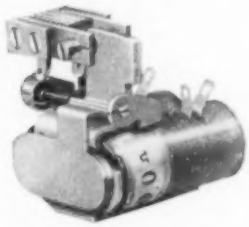
Extra Rugged, Compact 400-Cycle AC Relay Offered in New AF Series

New AF Series, recently developed by Potter & Brumfield, will operate on any frequency in the general vicinity of 400 cycles with 15 grams or higher contact pressure at approximately 2 VA input per movable pole. Advanced construction withstands better than 10-G vibration with any contact arrangement up to 2 Form C (DPDT) contacts.

New unit is available open as illustrated or hermetically sealed with 3-stud mounting and plug-in or solder-terminal glass-insulated header. Coils wound on molded bakelite bobbins with breakdown of 500 V. RMS minimum between all current carryingelements and to ground. Contacts rated 5 amps, 115 volts, 60-cycle, non-inductive load.



Ultra-Sensitive SS Series Feature Dual Coils; 10-G Vibration Resistance

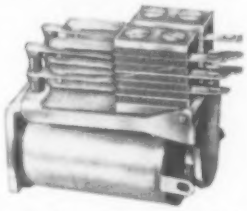


Brand new SS Series, DC Super-Sensitive Relays, provide operation with 10-G vibration resistance on less than 10 MW. New unit utilizes dual coils normally connected in series. Balanced armature with point bearings pivoted in adjustable mounts reduce friction to a minimum. Pure silver contacts rated 2 A at 115-V. AC or 28-V. DC, non-inductive load. Contact arrangement is 1 Form C (SPDT). Available with total coil resistance up to 60,000 ohms and sensitivity range from 1 MW to 2 W. Supplied open as illustrated or hermetically sealed with glass-insulated plug-in or solder-terminal header.

Design Engineer Gets More Help to Meet Tough Relay Requirements

Shown on this page are some of Potter & Brumfield's recent relay developments. Constant creation of new relay structures offers today's design engineer more help in his search for miniaturization, ruggedization, acclimatization, higher contact capacities, more contact combinations, greater sensitivity and longer life.

MH Series Offers Maximum Conversion Efficiency; Many Contact Combinations, DC or AC



Smallest and most versatile of the telephone type relays, MH Series offers maximum coil power, a wide selection of contact combinations and high contact capacity. Available open or hermetically sealed with maximum of 12 contact springs for either DC or 60 cycle AC operation.

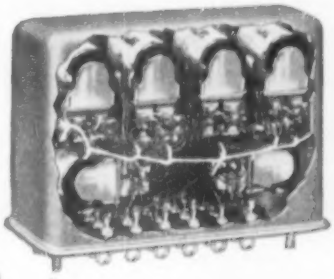
MJ Series Feature Longer, More Flexible Contact Arms; Lower Spring Load Rate, DC or AC

Newly developed MJ miniature telephone type relay features longer and more flexible contact arms which result in a lower spring load rate. This structure permits wider contact gap, more overtravel, improvement in sensitivity, faster action and longer life. MJ supplied open or hermetically sealed, with maximum of 12 contact springs, for either DC or 60 cycle AC operation.

Coils for both relays furnished up to a maximum resistance of 22,000 ohms for either current or voltage actuation. Insulation resistance better than 1000 megohms and breakdown above 500 V. RMS.

Hermetic Sealing or Dust Covering Available for All Individual Relays or Multiple Groups; Keep Out Dust, Fumes, Moisture, Etc.

- New "L" Type deep-drawn steel enclosure accommodates six MH relays or one standard LT telephone type relay, not shown on this page. Mounting is by 4 studs. Available with maximum of 24 solder terminals. Dim. $2\frac{3}{16}$" x $4\frac{11}{16}$" x $3\frac{5}{32}$" high.



- New "D" Type deep-drawn steel enclosure is designed for sealing the AF Series 400-Cycle AC relays, but will accommodate the MH or MJ relays shown above. Supplied with standard octal 7, 9 or 14 pin miniature plug or up to 14 hot-tinned solder terminals. Dim. $1\frac{3}{16}$" x $1\frac{29}{32}$" x $2\frac{3}{16}$" high.

- **Samples, Recommendations and Quotations on Request**
- **P&B Sales Engineers in Principal U. S. and Canadian Cities**
- **Write for Master Catalog Showing Full Line of Basic Structures**
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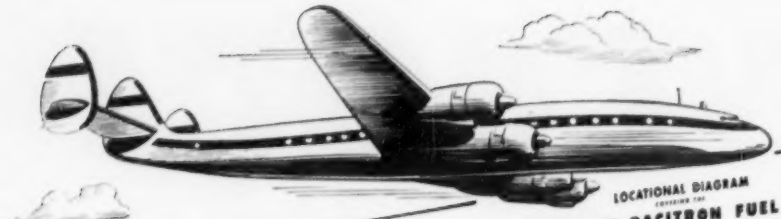

Star Performers in the New Super Constellation

. . . SIMMONDS CAPACITANCE FUEL GAGES

Certain to set new records in speed, economy and range are Lockheed's new Super Constellations with Wright Turbo Compound engines. Like their distinguished predecessors, these luxury liners are equipped with Simmonds capacitance fuel gages.

From the day the latest Super Constellations are delivered to more than a dozen U.S. and foreign airlines, operating crews will have the advantage of accuracy unsurpassed in fuel gaging – plus Simmonds' complete field service. This includes clear, detailed instruction manuals, technical bulletins and the unique visual aid location charts (illustrated above).

Also available for initial instruction and routine checks is Simmonds' staff of expertly trained field engineers – strategically located throughout the U.S. and Europe.

More U.S. commercial transport planes are equipped with Simmonds fuel gage systems than any other electronic type gage. For star performance, look to Simmonds – "first in electronic fuel gaging."

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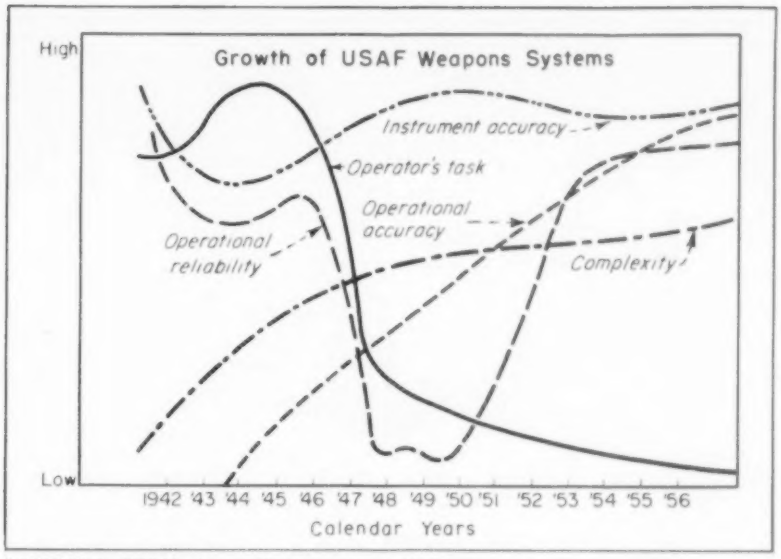


INTERRELATION of many factors governs effectiveness of weapons systems.

nelli with cutting equipment downtime. Prolific use of fuses limits a malfunction to a single chassis instead of causing a string of other failures in associated chassis. This saves considerable trouble-shooting and repair time, Paganelli pointed out.

▶ **Another Solution**—The use of ultra-conservatively rated components may not be a satisfactory solution to the reliability problem in avionics equipment where size and weight are critically important. J. M. Bridges of the Navy Bureau of Ordnance suggested other possible avenues toward improved reliability. He called for "more thorough engineering" before new electronic equipment goes into production.

Pointing the finger at both the military and at industry, Bridges warned that "we must divert funds from research and put them into engineering and testing." He called type-testing of prototype equipment "a must."

▶ **Too Much Automaticity?**—Bridges also warned that "we have gone too far toward automaticity." He called for the "elimination of unnecessary gadgets" and reminded engineers that their motto should be: "It has to be able to work in battle."

Admitting that the military's "maintenance forces have not kept pace" with the growing complexity of modern weapons, Bridges said that "we must step up training and get better test equipment."

▶ **In the Heat of Battle**—One phase of equipment design too frequently overlooked is the complexity of its operation from the user's viewpoint.

Nordlund's paper said: The failure to apply "human engineering" fundamentals to design sometimes results in equipment which requires "so many parallel actions (by the operator) . . . at a time of great emotional strain . . . that his ability to reason and rationalize is destroyed." For example in World War II, "Gross errors in . . . bombing . . . resulted from the operator actually forgetting to perform some important calculation or . . . making an erroneous calculation . . ." Nordlund's paper said.

"The disparity between (inherent instrument accuracy) and actual operational accuracy (in World War II) was enormous because of the large demands made upon the human at the wrong time," Nordlund's paper added.

▶ **Psychological Approach**—"Electronic equipment does not have to be complicated (from a circuitry viewpoint) for human performance to be hampered," Dr. B. J. Covner, an industrial psychologist with Dunlap and Associates, said. "Psychological knowledge and research techniques, recently called 'human engineering,' can help to optimize human performance . . ." Covner added.

He described the results of a series of tracking tests in which 18 subjects were checked on their ability to move a control stick or handle to maintain an instrument needle centered. (The test resembled the task of a pilot making an ILS approach.) Tests were run with various combinations of good, average, and poor controls, and good, average, and poor visual needle displays.

The results of these tests, according to Covner, showed:

- Good control and a good indicator, 1% tracking error.
- Good control and an average indicator, 10% tracking error.
- Good control and a poor indicator, 29% tracking error.
- Poor control and a good indicator, 10% tracking error.
- Poor control and an average indicator, 18% tracking error.
- Poor control and a poor indicator, 33% tracking error.

Covner concluded that "there must be a natural or expected relationship between controls and indicators for best performance to be obtained. . . . Unnatural movements require longer learning and tend to break down under stress," he said.

▶ **Another Assist**—The psychologist can also help the engineer decide whether a design improvement justifies its added cost and complexity, Covner pointed out.

For example, the addition of a plastic cursor to a radar scope may increase the accuracy with which the operator can read target range and bearing, but it will take him longer to do it with a cursor, Covner said. Thus, more accurate information might actually slow down procedure sufficiently to make a system less effective, particularly if the operator is trying to track a fast moving target, Covner concluded.

▶ **Easing the Operator's Task**—The introduction of radar bombing systems late in World War II actually lowered bombing accuracy at first despite the fact that the radar bombsight was inherently a more accurate instrument. This was one of several interesting observations possible from a set of curves shown in connection with Nordlund's paper.

The reason for this anomaly, Nordlund's paper explained, was that the introduction of radar complicated the operator's task so much that operational accuracy suffered.

This situation was corrected when a new system (presumably the Sperry K-type bombing system) was introduced in 1946. The new system was designed "to best use the human operator," Nordlund says. However, the new equipment was so complex from a standpoint of circuitry, that the Air Force at first couldn't keep it operating. So, despite higher accuracy and simplified operation, the new system was ineffective because of low operational reliability.

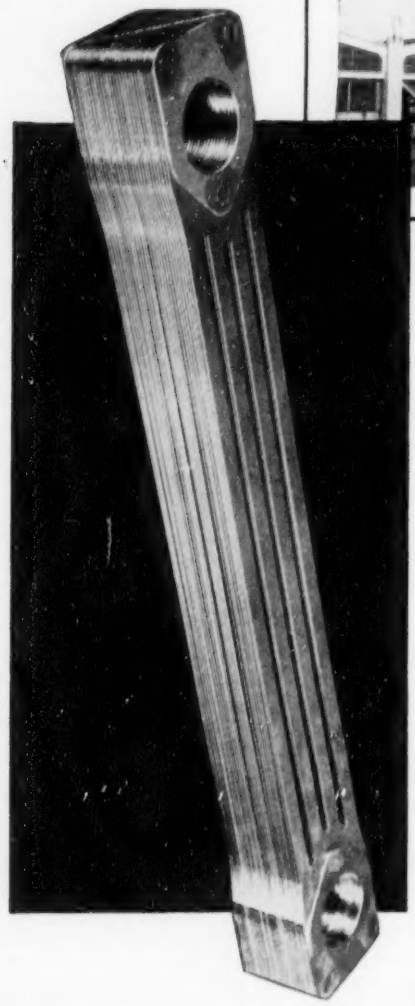
Operational reliability of the new (bombing) system had just begun to rise, when a new and more complex version of the system was introduced, and operational reliability again tumbled.

By what Nordlund calls an "agonizing" and very expensive 'bootstrap' operation in which basic mistakes of installation which adversely affected the equipment environment were corrected," the USAF got the operational reliability curve on the upgrade. Since 1949 operational reliability has continued to climb, Nordlund's curves show.

▶ **Significant Curve**—The significant thing about Nordlund's curves, which at best are only an approximate estimate, is that the operational accuracy curve

The YH-21 "Work Horse" manufactured by Piasecki Helicopter Corporation, Morton, Pa., is the largest helicopter used by U.S. Military Forces.

Tension-torsion strap assembly consists of 25 stainless steel straps separated by spacers. It is connected with rotor blade and rotor hub by stainless steel pins.



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The strap carries the centrifugal force generated by the revolving blades yet allows changes in pitch. Because of the new stainless steel strap, thrust bearings have been eliminated and the assembly lightened. Friction has been reduced, making it easier to change the pitch of the blades.

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has continued to rise in spite of the gyrations of the other curves. Nordlund thinks that it proves "that the decision in favor of circuit complexity was a sound one."

There is no room for complacency, Nordlund warns, pointing out that "reliability is at present far from acceptable." "We are paying far too high a price in maintenance, attrition, and mission failures," he says.

▶**Misuse of Vacuum Tubes**—"The Number One factor in tube failure is poor application (of vacuum tubes)," John E. Gorham of the Signal Corps Engineering labs said. This is a serious indictment because vacuum tube failures are the Number One cause of equipment failures.

Gorham's statement is based on a Signal Corps study which shows that although tube life need not be affected by the type of equipment (radar, communications, etc.) in which the tube is used, the Signal Corps has found a 10-to-1 variation in tube life between different equipments.

Gorham concludes that "careful engineering of circuits can improve average (tube) failure by a factor of 10."

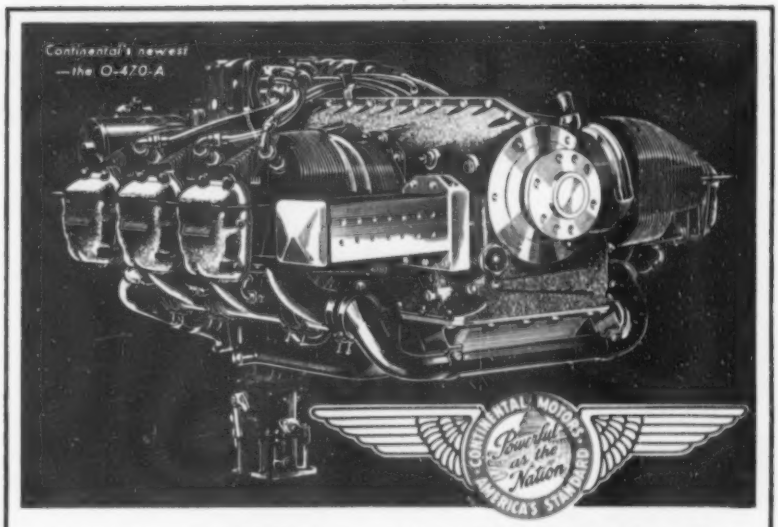
▶**Tube Application Handbook**—"If all equipments used tubes exactly at, and at all times within, the maximum ratings on the JAN specification sheets . . . there would be a fair degree of certainty as to a safe life expectancy," Gorham said. Because this isn't done, the Signal Corps, according to Gorham, is now sponsoring a program to "study the effect of different (other than JAN spec) operating conditions, such as various currents, voltages, conditions of vibration, and temperature on the life of tubes."

From these studies, Gorham said, the Signal Corps hopes within two or three years to publish a handbook for electronic equipment designers which will enable them to predict tube life under the specific operating conditions required for their individual equipments.

Military electronics manufacturers need not await such a handbook to obtain help in current tube application problems. The Panel on Electron Tubes (of the Research and Development Board) will send a team of specialists to assist design engineers, Gorham said.

The panel consulting team usually consists of three engineers drawn from different tube manufacturers and research organizations plus a military service engineer.

The Signal Corps hopes to extend its study of tube failures to Korea to obtain combat data, Gorham said. With such information, the Signal Corps will be able to pinpoint specific avenues of tube and circuit improvement, Gorham predicted. The data will also



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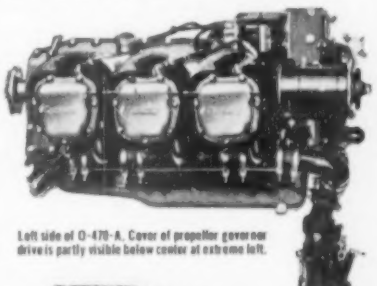
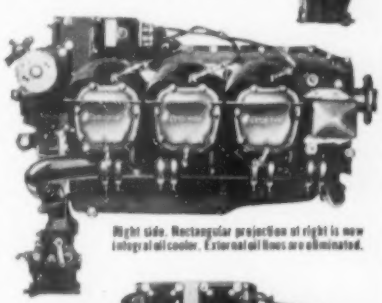
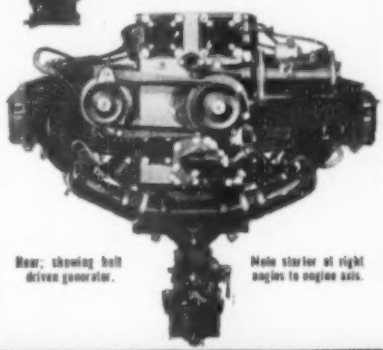

Left side of O-470-A. Cover of propeller governor drive is partly visible below cooler at extreme left.


Right side. Rectangular projection at right is new integral oil cooler. External oil lines are eliminated.


Rear, showing belt driven generator.

Main starter at right angles to engine axis.

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allow the Signal Corps to make competitive evaluations of the reliability of different manufacturers equipment.

▶ **Improving Tube Reliability**—Meanwhile the Signal Corps has begun the first step in a research and development program to further improve tube reliability, Gorham said. This is a study of possible automatic production techniques for manufacturing either tube sub-assemblies or the complete tube.

Although no results are yet available, Gorham said that there is "considerable reason to believe that this avenue of approach will improve reliability by eliminating variable factors due to human operators and . . . streamlining and simplifying . . . tube construction to permit automatic assembly."

FILTER CENTER

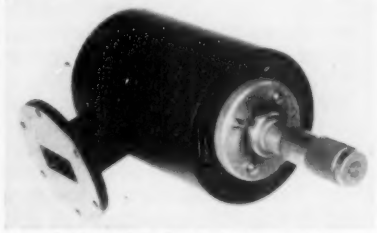
▶ **AC Power System for DC-8?**—Douglas Aircraft Co reportedly is planning to use 120/208-v., 400-cps. a.c. generators (alternators) as main power sources on its new DC-8 jetliner, replacing the 28-v. d.c. which is standard on present airliners. In this respect, Douglas is following lead of newer military aircraft which are using a.c. power. DC-8 equipment which needs d.c. will reportedly be fed from a small auxiliary d.c. generator or from rectified a.c.

▶ **Seeing-Eye Gun Camera**—Bolsey Corp. of New York City, which makes new USAF type N-9 gun camera (movie) used in fighters and bombers to record aerial combat, has developed new remote control which uses photocell to measure scene brightness and to adjust automatically camera exposure. Need for such a device arises because military switch from monochromatic to color film for gun cameras makes exposure much more critical. New Bolsey development continuously maintains correct camera exposure, even during rapidly changing light conditions. Device uses no tubes and operates from 24 volts d.c.

▶ **F2Y to Get M-H Damper**—Convair has contracted with Minneapolis-Honeywell to furnish a yaw and pitch damper system for its new F2Y water-based Navy fighter, the Skate.

▶ **Pioneer's New PB-10 Autopilot**—Eclipse-Pioneer Division of Bendix Aviation will soon begin demonstrations of an advanced version of its PB-10 airline/transport automatic pilot. Designated the PB-10A, the new autopilot has an improved plug-in fluxgate amplifier, better turn coordination, a new console controller, and uses integrators for improved barometric altitude and magnetic heading control. The Navy is currently installing a PB-10A in an R5D for evaluation.

▶ **Army Tests Gavco ADF**—Army is testing a Gavco Corp. automatic direction finder at Monmouth (N. J.) County Airport for possible use on Army helicopters. Gavco ADF employs a double-loop antenna developed by Emil J. Simon. Intermittent use of sense antenna reportedly gives ADF a low noise level. Present experimental unit weighs 67 lb., but Gavco thinks it can be redesigned to about 20 lb.



HYBRID WAVEMETER

Reaction cavity wavemeter is one of a number of hybrid microwave components which have been redesigned by Demornay-Bonardi of Burbank, Calif., for operation between 5.3 and 6.5 kmc. with smaller (1.5x0.75-in.) waveguide when weight and volume are at a premium. The components were originally designed for use with 2x1-in. waveguide, normally used in the 3.95-to-5.85-kmc. region. The hybrid components can be used with 1.5x0.75-in. waveguide originally designed for 5.85-to-8.20-kmc.

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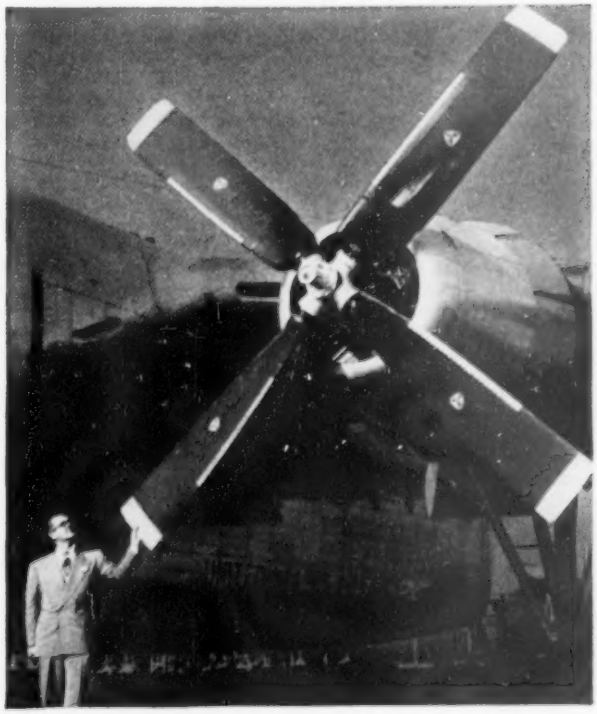

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AVIATION SAFETY

Civil Aeronautics Board Accident Report

AA DC-6—Lightplane Collision

Both occupants of a privately owned Temco Swift were killed when the craft collided with an American Airlines DC-6 coming in for a landing at Love Field, Dallas, June 28, 1952. The DC-6 landed safely. None of its 55 passengers or five crew members were injured.

CAB's official report of the accident finds that the pilot of the Swift failed "to exercise reasonable prudence" in his approach. The Love Field tower operator, viewing the two planes head-on, misjudged their relative positions. Although the Swift was ahead of the DC-6, the operator judged it to be trailing the larger plane and did not realize the danger of the situation until too late. CAB's complete report:

THE ACCIDENT

At 0656,[1] June 28, 1952, a privately owned Temco Swift, N 3858K, and an American Airlines' DC-6, N 90750, collided at about 400-feet altitude while both were approaching for a landing on Runway 13, Love Field, Dallas, Tex. The Swift fell in a left spin, striking the ground 4,410 feet northwest of the approach end of Runway 13. Both occupants of the Swift were killed; the DC-6 landed safely and no one on board was injured.

HISTORY OF THE FLIGHTS

Private Pilot Paul W. Brower and Passenger Don E. Walker departed Denton, Tex., in Mr. Brower's Swift between 0630 and 0640. Denton is about 37 miles from Love Field and almost in a direct line with Runway 13. Both occupants were employes of Central Airlines at Love Field, Dallas, and Mr. Brower had been commuting to work in his airplane almost daily for a period of several months.

While the Swift was approaching Love Field, a broken transmission was received by the controller in which only the words "straight-in approach" were heard. The aircraft was between the outer and middle markers at the time this transmission was made and less than 4.15 miles from the airport. Shortly thereafter, the Swift and DC-6, which were approaching for landing, collided. The left wing panel of the Swift was shredded by the No. 4 propeller of the larger aircraft. The Swift went over the fuselage of the DC-6, then spun into the ground. Both occupants of the small aircraft were killed and the aircraft was demolished.

The DC-6, operating as American Airline's Flight 910, originated at San Francisco, Calif., at 2305 on June 27, 1952. Scheduled stops were made at three points en route, and the flight was uneventful until approaching Dallas. It was cleared IFR (instrument flight rules) between El Paso, the last scheduled stop, and Dallas; however, since the weather was good, the captain canceled his IFR flight plan and conducted this portion of the flight VFR (visual flight rules).

Upon departure from El Paso at 0436 on June 28 there were 55 passengers, including four infants, five crew members, and 1,736 gallons of fuel aboard. The crew consisted of Captain G. H. Woolweaver, First Officer J. R. Poe, Flight Engineer J. W. Barrett, and Stewardesses A. R. Siebert and A. I. Schmid. The gross weight of the aircraft at departure was 2,082 lb. less than the allowable 79,875 lb., and the load was properly distributed with respect to the aircraft's center of gravity. First Officer James R. Poe was flying the aircraft from the right seat.

At 0650 Flight 910 reported over the Forth Worth radio range station at 5,000 feet MSL. The flight changed from company radio frequency to Dallas tower VHF frequency at this time. Continuing VFR along the east leg of the Fort Worth radio range, the flight descended to 2,000 feet MSL. When south of Grapevine, Tex., the Dallas tower was contacted and clearance received to approach for landing on Runway 13. Immediately following this contact the landing gear was lowered and the flaps were extended to the 20-degree position.

A right turn was made to intercept the Dallas ILS (instrument landing system) for final approach. Following the ILS localizer and glide path, the aircraft passed over the outer marker at an estimated altitude of 1,500 feet MSL (1,017 feet above the ground) and shortly thereafter was given clearance to land.

Cockpit checks had been completed, the aircraft was at an approach speed of approximately 130-135 mph., flaps fully extended (50 degrees), and landing gear down. First Officer Poe was making the final approach down the ILS glide path and localizer and was maintaining visual reference to the ground as opposed to full simulation of an ILS approach. In accordance with company policy, no hood or any other device was installed to obstruct vision in any manner.

During the final approach the pilots and the flight engineer of the DC-6 twice heard the tower give instruction to a light aircraft. Being thus alerted to the presence of another aircraft in the vicinity of the airport, they tried to sight it. At an altitude of approximately 400 feet, First Officer Poe, sitting in the right pilot's seat, sighted the Swift as it came into view from under the fuselage of the descending DC-6, almost abeam of his side cockpit window and

[1] All times referred to herein are Central Standard and based on the 24-hour clock.

slightly lower. In the fraction of a second remaining before the collision, he had insufficient time to take effective evasive action.

THE INVESTIGATION

Two passengers in the DC-6, both U. S. Air Force pilots, had an opportunity to observe the Swift for several seconds. 1st Lt. Phil C. Brockman was sitting in Seat 26, next to the window, in the left rear of the aircraft; Maj. Cody U. Watson was seated in the forward right portion of the cabin, next to a window, in Seat 5.

Lt. Brockman stated that the Swift first caught his attention when it was 45 degrees left of the DC-6 nose, 20 degrees low, less than 500 feet ahead, and on approximately a parallel course. The DC-6 was in straight descent at about 1,000 feet altitude and overtaking the Swift. Within a few seconds, when "the Swift was uncomfortably close," it turned to the right in approximately a 15-degree bank and disappeared from view underneath the left wing and fuselage. Lt. Brockman heard the two aircraft collide. A few moments later, he again saw it from his window in a left spin.

Maj. Watson saw the Swift as it came into view from under the DC-6. Initially, it was approximately 50 feet below the descending aircraft, slightly to the right, 150-200 feet ahead of the DC-6, and on the same general heading. The aircraft appeared to be in a 5-10 degree left bank; the wings of the DC-6 were level. The two aircraft converged and he felt an impact. The light aircraft swept back over the right wing panel and fuselage of the DC-6 and out of sight. Maj. Watson estimated that he had the Swift in sight only two or three seconds.

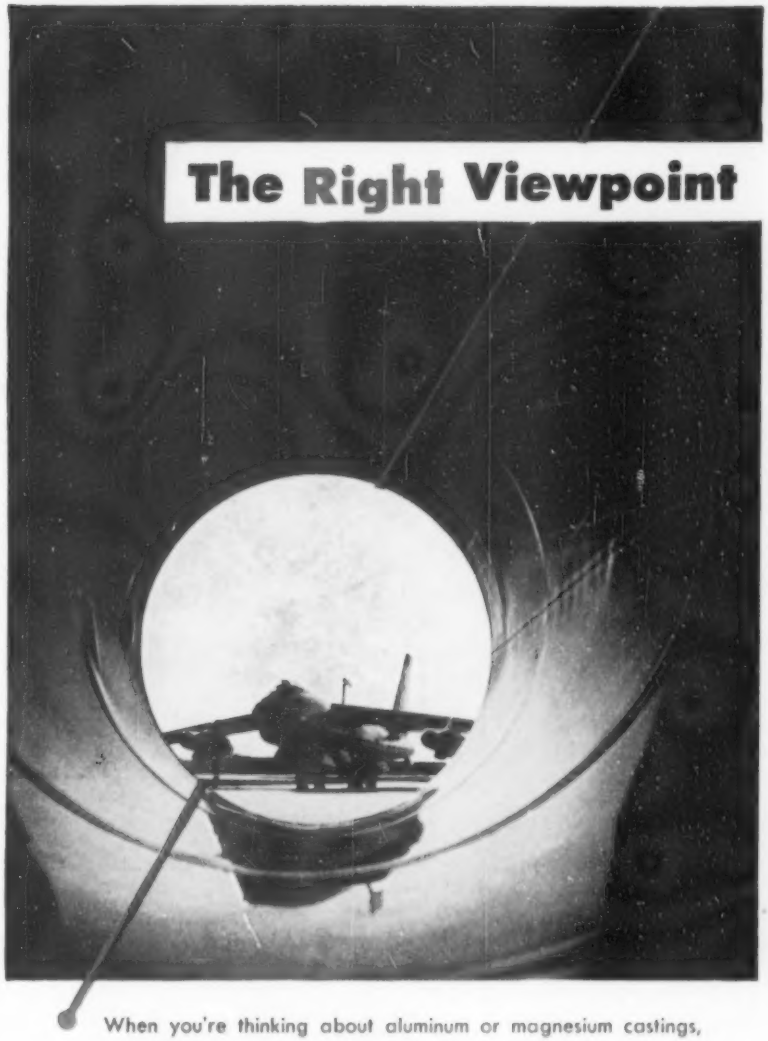
The observations of these two eyewitnesses, in addition to those of First Officer Poe, established that the Swift crossed the course of the DC-6 from left to right before the collision.

While delivering clearance for Flight 910 to land, the Love Field tower controller heard a weak and broken message transmitted from an aircraft radio operating on either 3105 kilocycles or 122.5 megacycles. He heard only the words "straight-in approach." At about the same time, he saw a light aircraft in level flight at about 500 feet altitude and stated that it appeared to him to be about one-half mile behind the higher DC-6 than in its final approach. Both aircraft were on a southeasterly heading to the approach end of Runway 13 and both therefore presented a head-on view to him.

The controller transmitted to the unidentified aircraft as follows: "AIRCRAFT CALLED LOVE TOWER BE NUMBER TWO TO LAND FOLLOW THE AMERICAN SIX THERE AHEAD OF YOU. RUNWAY ONE THREE WIND SOUTH SOUTHEAST TEN."

This transmission was made immediately after the DC-6 was cleared to land No. 1. The DC-6 and the Swift appeared to be converging rapidly. Owing to the distance and the fact that the aircraft presented a head-on view against the clear sky, he believed the Swift was a Beechcraft Bonanza.

Concerned about the convergence and



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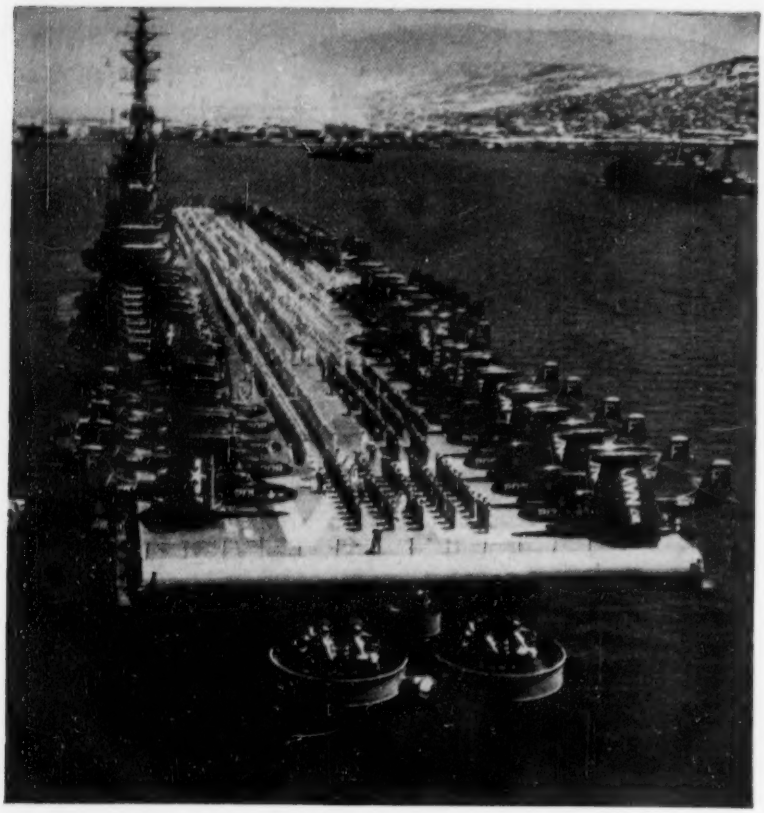

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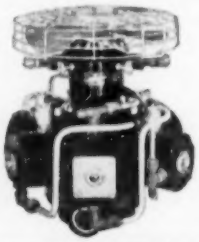

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still of the belief that the Swift was overtaking the DC-6 from the rear, the controller, only a very few seconds before the collision, advised as follows: "BONANZA GIVE WAY TO YOUR RIGHT OR LEFT. MAKE A RIGHT OR LEFT TURN IMMEDIATELY THERE."

This transmission was made after the Swift had crossed the path of the DC-6 from left to right. The controller did not see the crossover. By the time he realized that there was imminent danger of collision, he had no opportunity to transmit precautionary advice to the pilots of the DC-6, in addition to the last instructions which he had given to the pilot of the smaller aircraft.

It appeared to the controller that the pilot of the Swift immediately made an abrupt left bank following this transmission, and collision occurred immediately. He stated that the Swift appeared to be flying at constant altitude at all times before the crash. The controller testified that he did not learn that the Swift had not overtaken the DC-6, as was his impression, until investigation revealed that it was in front of the DC-6 during the entire period he had the Swift in sight.

Investigation disclosed that the controller had over six years' experience and his ability as a controller was entirely satisfactory. He had served in the Dallas tower since July 10, 1949, and in addition, held a currently effective commercial pilot rating; no physical defects or impairment of vision were found at the time of his last CAA Class II physical examination completed on June 9, 1952.

The approximate positions of the two aircraft at various points along their respective flight paths were obtained through statements and testimony of the DC-6 pilots, two passengers of the DC-6, cruise performance data for Swift aircraft, and the statements of ground eyewitnesses.

Examination of the Swift wreckage revealed that the aircraft initially struck the ground nose-down 80 degrees, right wing first, then came to rest on the lower side of the fuselage. The severed leading edge of the left aileron fell separately, striking a house located some 250 feet from the main wreckage; the left outboard aileron hinge also fell separately and was approximately 75 feet from the main wreckage. The landing gear and flaps were retracted. The altimeter was found set at 30.10 inches; this setting has been transmitted to another aircraft by the Love Field traffic controller at 0648. There was no evidence that any component part of the aircraft had malfunctioned or failed, with the possible exception of the VHF transmitter.

The shredded left wing panel revealed five propeller cuts progressing in succession from the trailing edge toward the leading edge of the wing panel. Study of the cuts indicated that the wing of the Swift was struck on the under surface and that the Swift was in a left bank upon collision.

The radio equipment installed in the Swift was too severely damaged by impact to determine its operating condition, with one exception. The Narco VHF transmission line connecting the transmitter to the

antenna fell free from its plug during inspection. The portion of transmission line within the plug was covered by corrosion and since there was no evidence of a recent break in this connection, it was indication that it had not been properly soldered. This might account in part for the poor transmissions; however, investigation revealed that the transmitter and receiver operated properly during a flight made by Mr. Brower the night before the accident.

A General Electric Model AS-1B transmitter-receiver was combined with the VHF transmitter. The GE transmitter was equipped with a crystal for transmission on 3105 kilocycles. The VHF crystals were found to be active and on frequency. The radio controls had been positioned as follows at the time of the accident: VHF transmitter on 122.5 megacycles, and receiver tuned to 278 kilocycles (Dallas tower frequency).

Damage to the DC-6 consisted of: Nicks and scratches in all three blades of No. 4 propeller; the high frequency radio antenna mounted above the fuselage between the vertical fin and roof of the cockpit, struck 22 feet forward of its rear mount and broken; damage to the antenna connecting cable and tension spool; and slight damage to the fin near the rear antenna mount.

The statements of passengers Watson and Brockman, observations of a ground eyewitness, and damage to the antenna definitely established that the Swift went over the fuselage of the DC-6 after being struck by the propeller.

It was also conclusively established that the DC-6 and the Swift were the only two airborne aircraft in the vicinity of Love Field and no other aircraft was landing or taking off.

Two traffic controllers were assigned to the 2400 to 0800 watch, as is the usual custom at Love Field. When the accident occurred, the second controller was temporarily absent. However, the controller on duty stated that he did not consider being alone imposed any handicap on his tower duties.

Although the flight had been en route for almost eight hours, both pilots of the DC-6 testified that they were mentally alert and were not physically fatigued. Their last CAA physical examinations revealed no physical defects or impairment of vision; the same was also true of Mr. Brower, the pilot of the Swift.

The sun at the time of the accident was 17 degrees high and five degrees to the left of the DC-6's heading. Weather was clear with thin, scattered clouds at 25,000 feet; visibility 15 miles or more; and wind southsoutheast at 10 mph.

ANALYSIS

The proximity of the two aircraft just before the collision, combined with the closing speed, made it impossible for the pilot of either aircraft to take effective evasive action. It is questionable that the pilots of either aircraft could definitely have seen one another between the outer marker and point of collision. Their actual relative positions cannot be conclusively established between these two points.

The Swift pilot either failed to indicate his intention to land while still some distance from the airport, or was unsuccessful in attempting a transmission to the tower. In any event, information necessary for initiation of positive traffic control was not received by the controller. A position report by the Swift would have enabled the controller to be apprised of the aircraft, its position, and approximate speed; thus he would have had time to properly space the two approaches.

It could be expected that had the controller known the actual relative positions of the two aircraft, he would have been less likely to have made an error in depth perception (reversing the actual positions of the two aircraft).

The Swift was assigned No. 2 landing sequence shortly after the DC-6 passed over the outer marker and was given clearance to land No. 1. No further transmissions were made by the controller until he instructed the smaller aircraft to turn right or left and the accident occurred immediately thereafter. It is about three miles from the outer marker to the scene of the accident.

There is no indication that the pilot of the Swift took adequate measures to locate the DC-6 either by a query addressed to the controller or efforts to clear the area visually. If the crossover (prior to the controller's final message) was made with the

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intent of locating the DC-6 it did not satisfy that purpose for the Swift pilot; thus placed his aircraft in a position where collision was inevitable.

Since the Swift pilot had been commuting to Love Field for a number of months, he should have been aware of the local airport traffic rules, as required by Civil Air Regulations. One of these rules requires aircraft equipped with a transmitter to call the tower while 10 minutes from the airport. Had the Swift pilot done this, there would have been ample time for him to comply with the tower's instructions to land No. 2 behind the DC-6. His message, transmitted somewhere between the outer marker and point of collision, indicated by the words "straight-in approach" that he intended to make such an approach.

Owing to indications that the transmitter in the Swift was intermittently inoperative, it is not known whether an earlier transmission was attempted. The DC-6 radio contacts were made in accordance with approved operating procedures for the route.

If two-way radio contact could not be established, owing to radio failure, it was the duty of the Swift pilot to approach the traffic pattern with caution, complying with air traffic rules for VFR flight. Since two-way radio contact was not established, he should have proceeded with due regard to the possibility that other aircraft were in the area. It appears, however, that he proceeded inbound past the outer marker toward Runway 13 without exercising reasonable prudence in his approach.

Although the sun offered some restriction to visibility, the line of sight from the DC-6 during the period between Grapevine and the right turn to final approach would have been slightly downward rather than directly into the sun. Owing to the small size of the Swift and the distance, the aluminum skin probably blended into the light-colored terrain to an undetermined degree, thus making the Swift difficult to see.

During the right turn of the DC-6 the Swift could very well have been in a blind area to the crew of Flight 910. From this point on, cockpit structure and the nose of the DC-6 presented considerable restriction to vision. Investigation indicated that the Swift would not have been visible to the crew of Flight 910 until only a second or two before collision. The Swift's exact altitude, heading, and speed cannot be accurately ascertained.

The pilots of the DC-6 were not aware of the presence of another aircraft in the area until they had reached the outer marker and had received clearance for landing. In the short time taken to fly from the outer marker to the point of collision, the pilots of the DC-6 tried to sight the other aircraft, but the Swift apparently remained in a blind spot forward and below the DC-6 nose structure, especially during the crossover. The Swift was in such a position relative to the DC-6, especially as the situation became more critical, that the pilots of the larger aircraft were unable to see it.

Furthermore, from the time the controller advised the smaller aircraft to turn right or left there was insufficient time for the DC-6 pilots to search properly the area ahead, below, and to the sides of their aircraft. The first officer was of necessity directing most of his attention to instruments within the cockpit, since he was practicing an ILS approach without a hood. After the Swift made the crossover, it was continuously in a blind spot to the captain until only an instant before collision, when evasive action was impossible.

The DC-6 had received clearance to land No. 1, and such a clearance is an indication from the tower that the approach path is clear. This is one of the basic functions of airport traffic control. The crew of the DC-6, therefore, could reasonably have expected to be able to complete their approach and landing without interference from other aircraft. A clearance does not relieve a pilot of the responsibility for maintaining vigilence. However, it appears that the crew of the DC-6 was maintaining an alert lookout, and did not act in a manner inconsistent with their responsibilities in failing to observe the other aircraft.

FINDINGS

On the basis of all available evidence, the Board finds that:

1. The carrier, aircraft, and crew of the DC-6, and the Temco Swift and its pilot, were properly certificated.

2. Local weather at the time of the accident was: clear with thin scattered clouds at 25,000 feet; visibility 15 miles or more; wind south-southeast at 10 mph.

3. The accident occurred at 0656 and at this time the sun offered some restriction to visibility.

4. Both aircraft were airworthy prior to collision.

5. American Airlines' Flight 910 had been cleared to land No. 1 from a straight-in approach to Runway 13.

6. The Temco Swift, assumed by the tower to be a Bonanza, was assigned No. 2 landing sequence when the tower controller assumed the small aircraft was to the left, rear, and lower than the DC-6.

7. When the controller anticipated the collision, he countermanded the clearance of the small aircraft to land No. 2 by instructing it to turn left or right immediately.

8. The relative positions and attitudes of the two aircraft at the instant the Swift first became visible to the first officer of the DC-6 made it impossible for him to take effective evasive action to avoid collision.

9. The two aircraft collided at approximately 400 feet altitude and 4,410 feet from the approach end of Runway 13 resulting in the destruction of the Swift; the DC-6 continued to a normal landing.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was the Swift pilot's failure to exercise reasonable prudence in his approach; errors in judgment of the situation on the part of the controller were a contributing factor.

BY THE CIVIL AERONAUTICS BOARD:

/s/ *Oswald Ryan*
/s/ *Josh Lee*
/s/ *Joseph P. Adams*
/s/ *Chan Gurney*

WHAT'S NEW

New Publications

The Air Traffic Story, prepared by the Radio Technical Commission for Aeronautics, is designed to give its readers a speaking acquaintance with the transition-period Common System of navigation now coming into use, the many airborne and ground equipments which the system employs, and the role that each plays.

In extremely interesting and easy to understand language, the 150-page booklet traces the historical development of navigation aids up to the present system. It then discusses fundamental principles of operation of each type of equipment in non-technical language. Following this, the reader embarks upon a hypothetical flight with a step-by-step report on cockpit navigation procedures involved in using the Common System.

A glossary of standardized navigation terminology and a comprehensive index complete The Air Traffic Story and make it a basic reference for the field of civil air navigation.

Copies are available for 50 cents each from the Radio Technical Commission for Aeronautics, 1724 F St. N.W., Washington 25, D. C.

Importance of Turbine Discharge Temperature Control is a four-page information letter, one of a series, being distributed by Pratt & Whitney Aircraft Division to persons interested in operation of its Turbo Wasp engines. The bulletin can be filed in P&WA's Manual of Aircraft Gas Turbine Operation binder.

Uniform nomenclature for identification of all items purchased by the Defense Dept. is included in an index being distributed in limited quantities by Air Materiel Command to contractors and manufacturers. The new index gives a common supply "language" to all Air Force, Navy and Army materiel. USAF contractors may receive the alphabetic Part I of the guide from the Cataloging and Packaging Division, Directorate of Supply and Services, Hq., AMC, Command, Att. MCSISD, Wright-Patterson AFB, Ohio.

Telling the Market

Torque testing equipment and tools are detailed and prices given in catalog available from Richmont, Inc., 808 W. Santa Anita St., San Gabriel, Calif.

Commercial aircraft starters data folder 1500 describes and pictures the

JH6C line being made by Jack Heintz, Inc., Cleveland 1, Ohio.

Inkless strip chart speed recorders for up to 30 days on a single roll are covered in technical data sheet 81M being distributed by Meltron Instrument Co., 432 Lincoln St., Denver 9, Colo.

Special glass fabrics used in manufacture of tools, fixtures and jigs for aircraft production are described in data sheet P.G. 100 available from Madagascar Graphite & Mica Co., 92 Liberty St., N. Y. 6, N. Y.

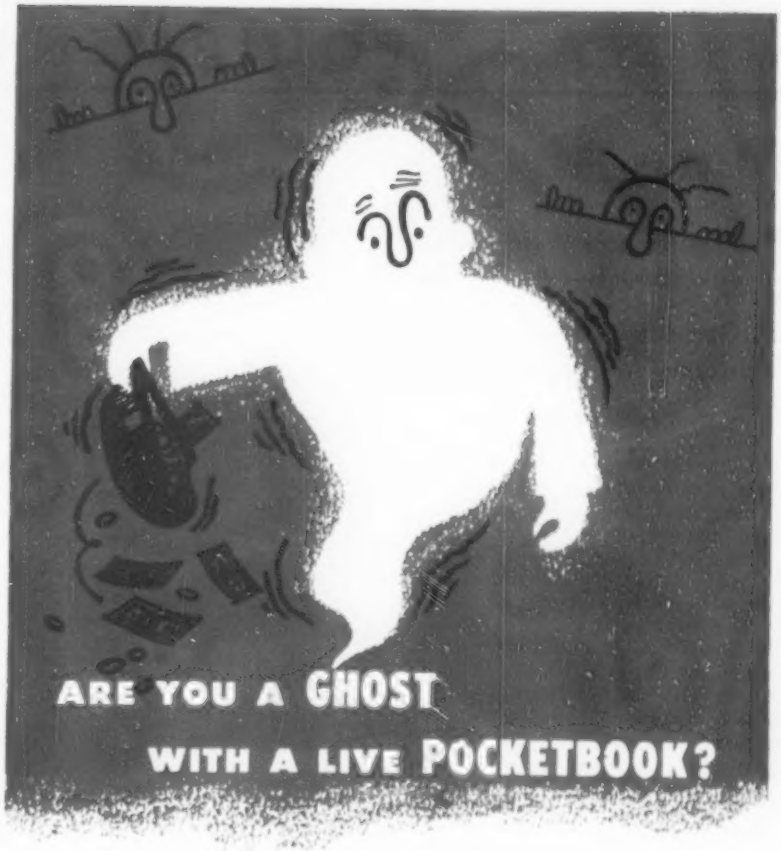
Ball screw assemblies, worm gears, fractional horsepower motors and other products of Vard, Inc., Pasadena, Calif., are described in new brochure being issued by firm. Also covered is the company's production facilities.

Electrical equipment of a diversified character is covered in a new series of bulletins from Inet, Inc., Los Angeles, Calif. Subjects covered (bulletin numbers in parenthesis) are: engine generator, trailer (GG tr 852), self-propelled engine generator (GG sp 852), mobile and stationary regulated rectifiers (RR agp 852), Magni-Volt low-voltage regulated direct-current power supply (RRPSMVF 852), and precision power supply unit for computers (PPS-852).

Vinylite resin VMCH surface coating applications and technical data on specifications and formulations are covered in technical release 12, a 16-page booklet available from Bakelite Co., division of Union Carbide & Carbon Corp., 260 Madison Ave., N. Y. 16.

Publications Received

- **The Atom Story,** by J. G. Feinberg, pub. by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y., 1953, $4.75. The Atom in the language of the layman. Begins in Greece, five centuries before Christianity and ends with a series of forecasts for the future.
- **Arctic Solitudes,** by Admiral Lord Mountevans, pub. by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y., 1953, $4.50. Concise history of the search for the Northeast and Northwest Passages and the North Pole.
- **Popular Mechanics Album of Aviation,** by Edward L. Throm and Jas. S. Crenshaw, pub. by Popular Mechanics Co., 1953, $3.00. Story of aviation from ancient peoples to contemporary man.
- **Principles of Aerodynamics, Pitman Aeronautical Engineering Series,** by Daniel O. Dammasch, pub. by Pitman Publishing Corp., 2 W. 45th St., New York, N. Y., 1953, $7.50. Describes and defines the physical laws which are basic to aerodynamics and the methods used to apply these laws to specific problems.



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More Air, More Cooling for AA DC-7s

- **Freon gas-cycle units specified by American.**
- **Greater output at less weight is expected.**

By George L. Christian

Gas-cycle refrigeration, which has been all but overlooked for aircraft cabin cooling, will soon get a strong boost when the majority of Douglas Aircraft's speedy, turbo-compound-powered DC-7s appear with freon gas-cycle systems as the primary means of cabin cooling.

The freon units, similar to those used in household refrigerators, are being made by Carrier, Inc., of Syracuse, N. Y. The planes will also use AiResearch expansion turbine air-cycle machines to take care of overload cooling.

Airlines that will use the gas-cycle/air-cycle combination cooling system in their DC-7s are: American, 25; Delta and National, four each.

A similar installation is used in Boeing Stratocruisers.

▶**Fresh Approach**—Use of freon as a refrigerant in the DC-7 is largely a result of American Airlines' decision, when it bought a fleet of planes newer than the DC-6B, that it wanted to make substantial improvements in passenger comfort. Particular emphasis was placed on "the atmosphere the passenger lives in," as American's E. W. (Bunny) Fuller put it.

Fuller, AA's director-staff engineering, told AVIATION WEEK that his company consulted with Douglas on how best to "add a little air and lots of refrigeration" to the DC-6B's four tons of cooling and 100 lb./min. of air.

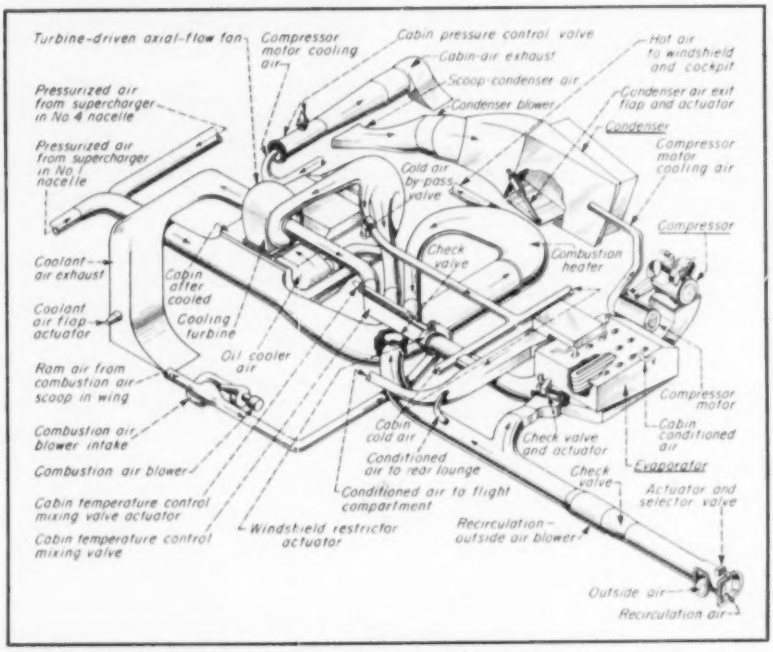
Fuller also wanted to obtain adequate in-flight cooling with only one of the plane's two cabin superchargers operative. This could not be done with the air-cycle refrigeration used in the DC-6B. With one blower out, air to cabin is reduced 50%. But since expansion turbine refrigerant output is in proportion to the cube of the input, cooling drops to ⅛ its original value.

W. W. Reaser, Douglas Aircraft air conditioning project engineer, suggested that freon was the best way for American to reach its goals.

▶**What They Get**—Here is what AA expects to get with its revamped pressurization-air conditioning system, composed of two Douglas-made cabin superchargers, an AiResearch air-cycle machine and a Carrier gas-cycle unit:

- 12% increase in supercharger airflow, through speeding up the unit by means independent of the cooling system.
- Increase in air-cycle machine's refrigerating capacity from four to six tons by providing the unit with more air and a larger intercooler.
- The refrigeration system is fully automatic, keeping the cabin at any preset temperature. The expansion turbine cuts in and out as demand requires. The crew has a master switch with which it can turn the whole system on or off.

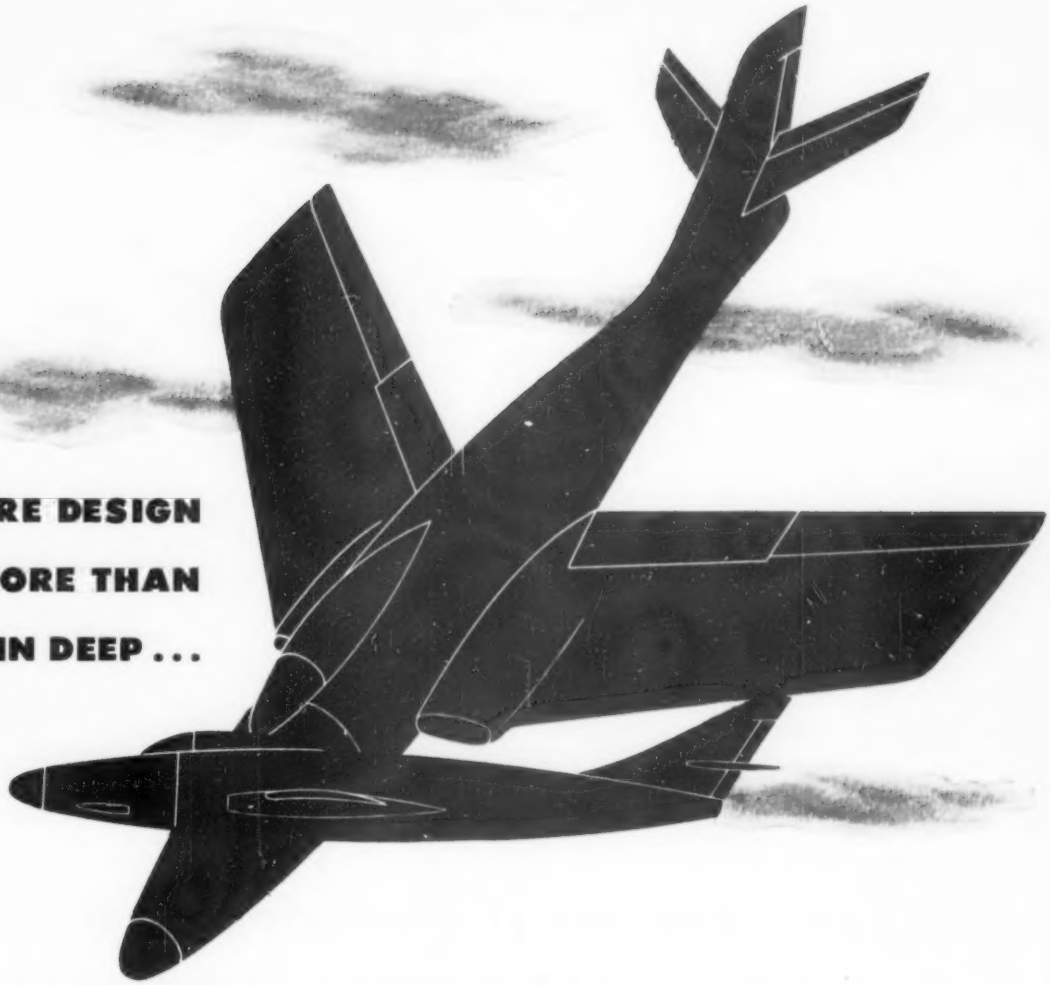
NEW DOUGLAS DC-7s being built for American, Delta and National will use . . .



GAS-CYCLE/AIR-CYCLE air conditioning system shown schematically above.

So American, with assistance from Douglas, AiResearch and Carrier, achieved its avowed goal of "adding a little more air and lots of refrigeration" to its DC-7s. Planes will have 112 lb./min. of air and 11 tons of cooling.

▶**Light, Cheap, Efficient**—Total installed weight of the freon system, including additional poundage of heavier generators (boosted from 300 to 400 amp.), ducts, wiring, etc. is approximately 480 lb., according to William Hannan, AA's air conditioning expert. This 480-lb. package gives five tons of refrigeration and weighs some 58



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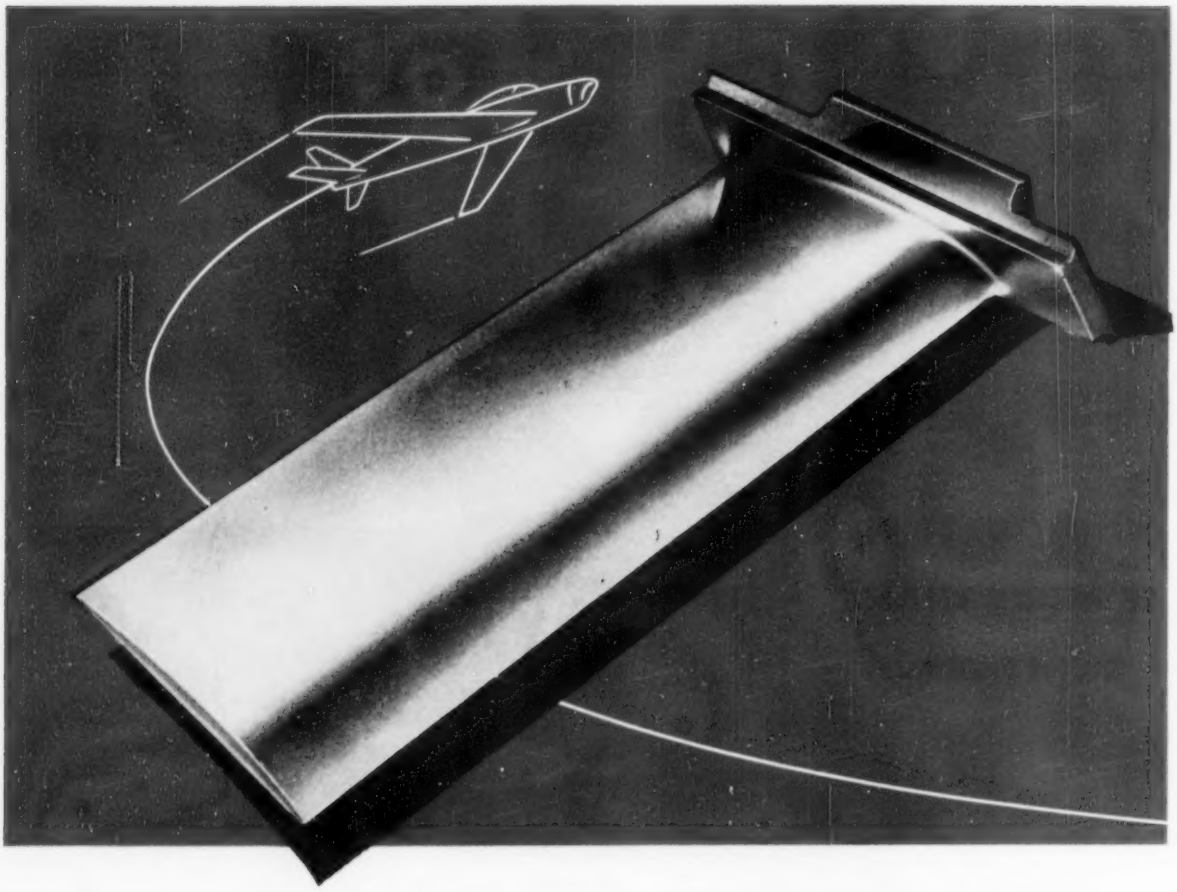

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pounds less than an expansion turbine of comparable output, Hannan added.

Initial cost of the gas-cycle refrigeration machine will be about one-fourth that of an expansion turbine with matching performance, according to estimates.

Efficiency of the freon unit in terms of horsepower requirements is considerably greater than expansion turbines; Hannan calculated that the freon system will draw about one-fifth of the power needed by an expansion turbine of the same capacity.

Furthermore, current DC-7 delivery dates could not have been met, AA says, if it had chosen the expansion turbine cooling system.

▶ **Unexpected Dividends**—Fuller pointed out these unexpected dividends which American hopes to receive as a result of its decision to go to freon cooling:

• **Ground cooling.** The freon system is capable of delivering its full five tons of refrigeration when the aircraft is on the ground with engines dead. Current to operate the system is supplied by the motor/generator set which is normally connected to the plane to supply power for lights, engine starting, etc.

AA makes a recirculating fan out of the normal ground blower to avoid pulling warm outside air into the cabin. The blower's output is about 78 lb./min. of air—ample to satisfy all cabin requirements on the ground. This eliminates need for a $12,000 refrigeration truck, as well as the vehicle's maintenance and the salary of its operator.

• **Fewer failures.** American, like other carriers, has been experiencing cabin supercharges failure peaks during sum-

VENTILATOR FIX

Northwest Airlines cut replacement of DC-4 magneto ventilators from 75% down to 1% and saved $2,015 in 1952 by using a rivet (right) in place of lockwire to keep stacked shells in the ventilators from vibrating loose. Wire could not be drawn tight and wore grooves (left) in part because of vibration and slipstream. Idea is Standford Larson's, master mechanic at NWA's St. Paul base.

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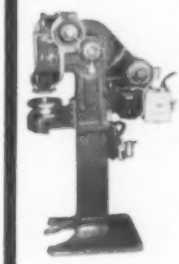

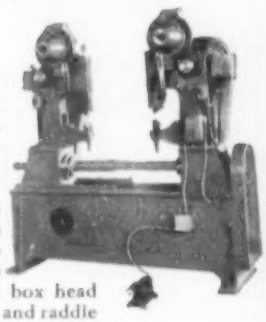

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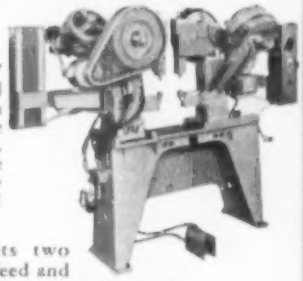

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mer months, because the units are forced to pump air against higher back pressures created by operating the expansion turbines for cabin cooling. Hannan estimated that the cooling turbines approximately double the work load imposed on the superchargers as compared to straight pressurization loads.

Since the freon machines will be used as the primary cooling system, with expansion turbines cutting in only to take care of overload conditions, the cabin superchargers will be relieved of a considerable work load. This, American hopes, will reduce summertime failures, help level off the peaks heretofore experienced, improve operation and reduce supercharger operating costs.

▶**Small Sacrifice**—Douglas was able to stow the freon system in the DC-7s with a minimum sacrifice of useable space.

• **Condenser** and associated ducting was tucked into the right wing fillet where it take no useable payload space.

• **Compressor and evaporator** were installed in the forward section of the rear cargo compartment where the two components take a total of 11 cubic feet of cargo space.

American officials feel that this is a small sacrifice to make for the overall advantages of the freon system.

▶**One From the Road**—Carrier, Inc.'s, compressor for the DC-7s is substantially the same unit the manufacturer supplies for Greyhound buses. Originally the bus-installed compressors were made of cast iron. The bus operator, in a parallel reminiscent of many a similar move by airline operators, quickly sponsored a program to lighten the compressor by using aluminum in place of cast iron.

The cast-iron compressor's weight sometimes resulted in the buses exceeding maximum highway loads, which in turn restricted passenger loads.

To lighten the freon system as much as possible for airborne use, Carrier went a step further. It redesigned the condenser and evaporator, as well as the compressor, in aluminum instead of copper. A standard refrigerant dryer in the freon system keeps water out.

American hopes to overhaul the compressors in its own shops at a cost of less than $300 per overhaul. And the compressor is a durable piece of machinery. An overhaul time of 4,800 hours is reported by Pan American for identical units installed in its Boeing Stratocruisers. Another carrier is said to be overhauling the compressors at 5,200 hours.

▶**Power Requirements**—Total electrical load imposed by the freon system is 450 amp. when the plane is on the ground and 300 amp. when the craft becomes airborne. The lower airborne load is the result of shutting off the ventilating and condenser cooling fans, which are not required in flight.

American is getting larger ground motor/generator sets. Airline spokesmen point out that this move is not directly attributable to the freon installation but is a desirable and logical step since its aircraft electrical requirements are becoming increasingly heavy.

The current sets, with outputs of 600 amp. continuous and 750 amp. for three minutes, will be replaced with units of higher amperage output. American has already service tested one such, the Hobart Model 871, which gives 1,000 amp. continuous, 1,200 for three minutes, and 1,500 for one minute.

▶**For the Future**—It is reported that Douglas engineers have built a complete and exact working mock-up of the entire DC-7 refrigeration system, including the superchargers.

Purpose is three-fold. First, the mock-up has already paid dividends in spotting sources of potential trouble prior to completion of the airplane. Next, the set-up will provide an ideal tool to train maintenance personnel of the various airlines using the DC-7.

Finally, AA says, the mock-up will be kept operational after the planes go into service. This will allow Douglas technicians to troubleshoot later difficulties without necessarily resorting to expensive flight testing.

Although actual service experience will be the only way to prove conclu-

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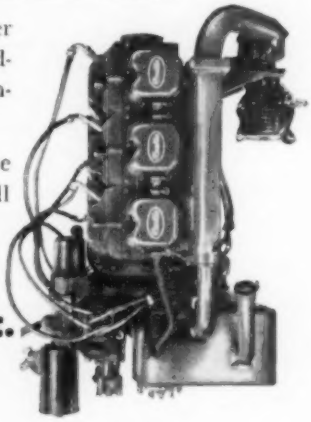

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fig. 1 *Actuating arm of switch held in depressed position and exposed to —100°F for several hours.*

fig. 2 *Actuating arm of switch released from depressed position responds instantly, demonstrating the flexibility of the Silastic seal.*

Photos courtesy Electro-Snap Switch and Manufacturing Company, Chicago, Illinois.

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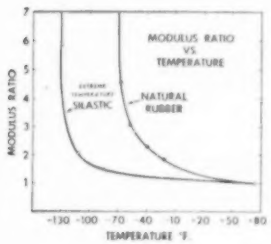

As a standard for low temperature performance, we call your attention to our data[1] on modulus ratios, or relative stiffening, as measured by the Gehman test method. According to these data (see Figure) the modulus for Extreme Temperature Silastic shows no appreciable change above temperatures in the range of —112 to —130°F. Rapid change in the modulus for natural rubber and for most silicone rubber stocks takes place between —40 and —70°F.

All types of Silastic show excellent resistance to oxidation, weathering and to a variety of hot oils and chemicals. Silastic stocks for electrical applications are unique even among silicone rubbers for low water absorption and excellent dielectric properties combined with good physical strength.

Data and actual performance prove that you can count on Silastic to retain both its physical and dielectric properties after long exposure to outdoor weathering or to temperatures far above and below the limits of natural or synthetic organic rubbers.

[1] *Polmanteer et al, Ind. and Eng. Chem. Vol. 44, Page 1576, July 1952.*
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Mail coupon today for data on the properties, performance and applications of Silastic.

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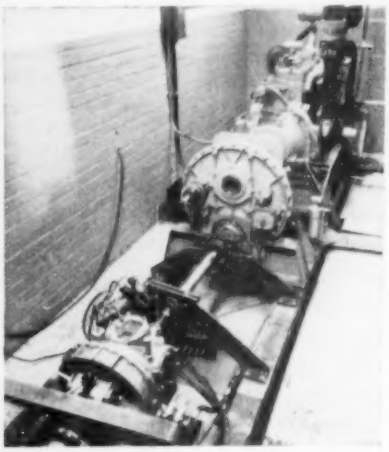
sively that the DC-7 freon system is as good as it looks on paper, Fuller is confident that gas-cycle refrigeration will be seen more and more in future aircraft.



Supercharger Tester Uses P-39 Nose Case

Capital Airlines mechanics have built up a cabin supercharger test rig incorporating the nose case of a Bell P-39 Airacobra.

The set-up is powered by a Chrysler industrial engine that delivers 86 hp. at 2,000 rpm. A 2¼-times step-up in speed is obtained by driving the supercharger through the P-39 nose case. The drive is reversed from the way it was in the aircraft—the Chrysler engine drives the propeller shaft and the supercharger is connected to the original engine drive.

To avoid the possibility of the nose case burning out, the engine's ignition circuit does not close until the nose case's oil pump has developed 50 psi. pressure. The rig also incorporates an electronic tachometer that measures driveshaft rotational speed.

The test equipment currently can check only the Western Gear superchargers that are mounted on Capital's 049 Connies. It is being converted to accept the AiResearch blowers and expansion turbine units used on 749 Connies.

Temperatures are now checked at seven points: the nose case, driveshaft bearing, supercharger bearing, supercharger oil spray, supercharger oil pump, oil in, and oil out. Five additional points will be added for testing of the AiResearch units.

OFF THE LINE

Rohr Aircraft Corp. has entered into licensing agreement with Pacific Airmotive Corp. granting the latter exclusive manufacturing and sales rights to the

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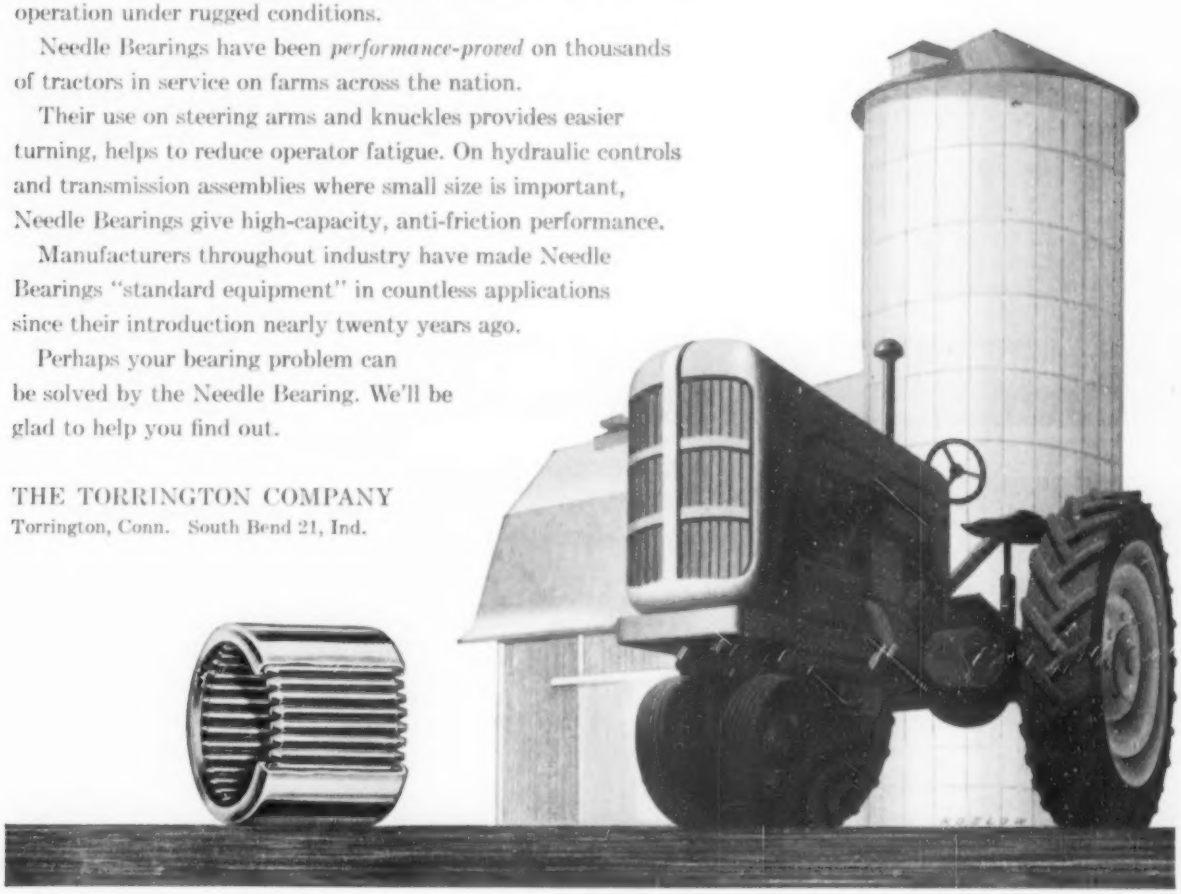

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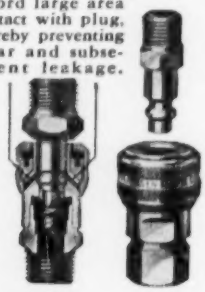
Locking pins in Hansen Push-Tite Coupling Socket afford large area contact with plug, thereby preventing wear and subsequent leakage.



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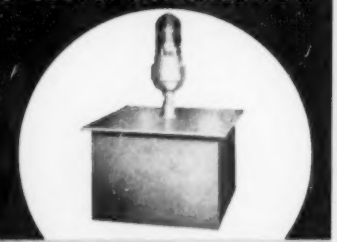

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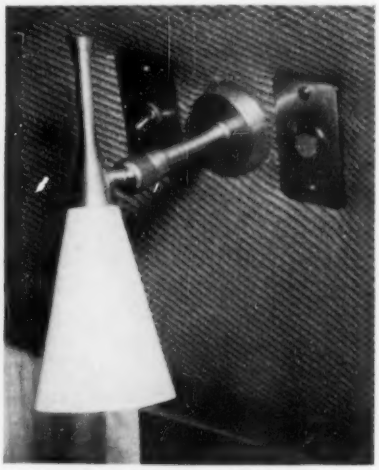
Rohr Tilting Arc device for handling and positioning aircraft engines. PAC's Burbank Aircraft Division will manufacture the arcs and national and international sales will be handled by the Aviation Products Division. The arc, designed and patented by Fred H. Rohr, is being used by both industry and the military.

Martin E. (Buddy) Anthonson has been dubbed Mohawk Airlines' "Flying Welder." He commutes daily from his home at Peru, N. Y., to the airline's maintenance base at Ithaca by Piper Clipper. Airline distance is 43 miles.

AiResearch Aviation Service Co. has been granted approval for installation of a geared rudder trim tab on DC-3s that will reduce rudder pedal forces 50%; limit rudder travel to 20 deg., thus keeping it out of the stall zone, and permit use of full 1,350 hp. for takeoff. Maximum takeoff power used without the tab is 1,200 hp., company says. Geared rudder tab is part of a general modification involving geared aileron tabs and prefabricated outer wing panel auxiliary fuel tanks, designed for CAA certification of DC-3s at higher gross takeoff weights. AiResearch says it holds exclusive rights on the engineering and commercial installation of the geared trim tab for rudder and ailerons. System is only one approved for use with electronic autopilots, the firm says.



ADJUSTABLE LIGHT

Ball-and-socket joint in this cabin reading lamp makes light adjustable in any position and eliminates danger of short circuit from twisting of wires. There are two contact points on the ball-and-socket joint that make positive contact regardless of the lamp position. Photo shows installation of lamp in Douglas DC-3 of Brazil's Instituto Medicamenta Fontoura, SA. Fontoura got the idea from an American-made floor lamp bought in Hollywood. The plane lamp was made by Acroparque Fontoura.

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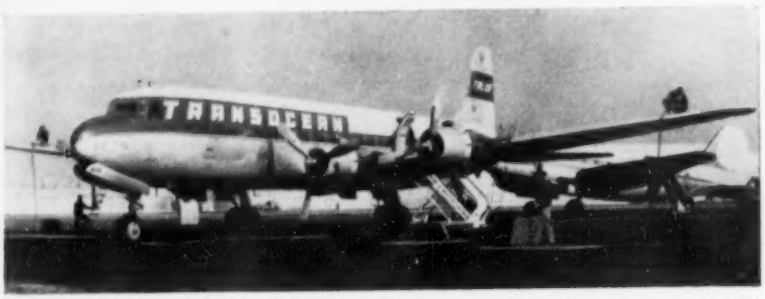

SIMULTANEOUS FUELING of both wings is one feature of Avomat system installed at Lockheed Air Terminal, Burbank. Plane shown is Taloa DC-4-type transport.

Pit Refueler Cuts Apron Hazards

Avomat, Inc., new entry in the pit refueling field, has completed an installation at Lockheed Air Terminal, Burbank, Calif.

The Avomat system permits simultaneous refueling of both wings at a maximum flow of 800 gallons per minute. Pit refueling eliminates the hazard and cost of operating large fuel trucks around congested airport aprons.

Avomat's installation at LAT includes three pits whose steel tops are flush with the ramp. Two pits contain 60 feet of hose on reels. The third pit houses metering units, grounding wires, etc. Also in the system is a 25,000-gal. underground tank from which fuel is pumped through a water separator and six-inch line by a 40-hp. electrically driven turbine pump.

Fire protection is given by a Walter Kidde set-up, including a 10-lb. carbon dioxide bottle in each pit, set off by Kidde temperature-rate-of-rise fire detectors.

Advantages cited for this application of CO_2 as an extinguishing agent are that it cannot damage pumps, hose of or motors; is a non-conductor of electricity, eliminating possibility of causing short circuits; and it dissipates into the atmosphere after discharge, leaving no mess to clean up.

METER PIT is between two hose pits. All are protected by Kidde CO_2 system.

Lockheed Air Terminal has only one gate position using the Avomat system during the current test period, but four gate positions may be operated simultaneously without additional pump facilities.

Avomat's address is 2627 Hollywood Way, Burbank, Calif.; Walter Kidde is located at Belleville, N. J.

Fuel Transfer Valve

A solenoid valve for controlling bleed of hot, pressurized air from jet engine compressor section to auxiliary fuel tanks has been announced by Valcor Engineering Corp. The pressurized air provides power for fuel transfer from the auxiliary tanks to the main tank.

The assembly is actually two valves in one, each with its own actuating solenoid, with some air passages common to both. One valve in the unit controls the transfer operation, allowing air to flow through to the auxiliary tank to provide transfer power. The other decompresses the tank after the transfer, to minimize the possibility of an explosion.

The air from the compressor may be as hot as 450F, Valcor says, as the heat rapidly dissipates as the air flows through the piping and into the tank. After the auxiliary is pressurized for transfer, all that is required is to open fuel valve and let fuel flow to the main tank.

Valcor attributes success of the valve in this application in part to the use of a "floating shear" seal which it claims has self-lapping and self-cleaning char-

GREAT "GOLDEN YEAR" AIRPLANE

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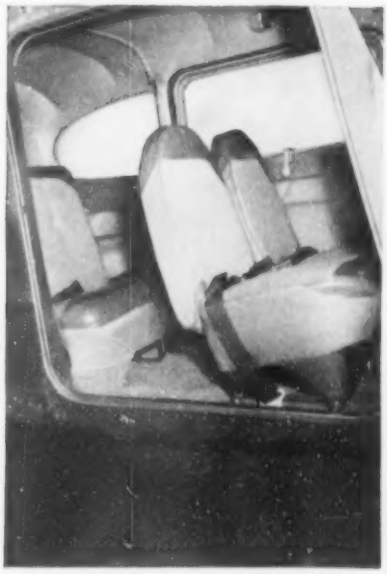
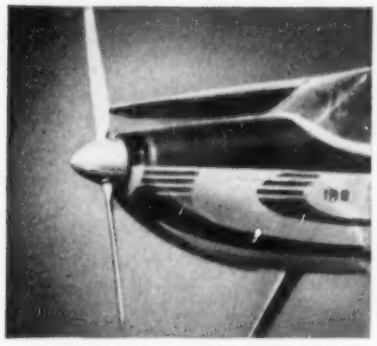
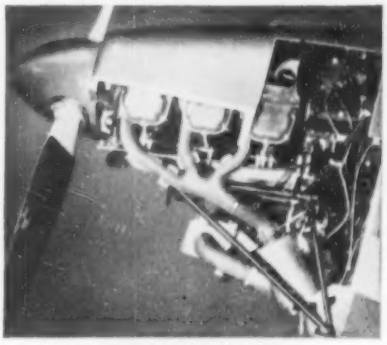


ROOMY, LUXURIOUS INTERIORS



CONSTANT SPEED PROPELLER

"JET" TAIL THAT REDUCES DRAG



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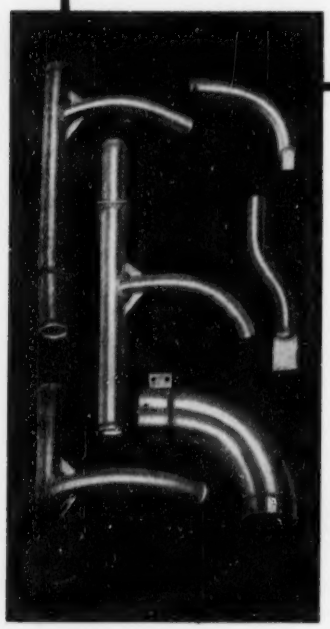

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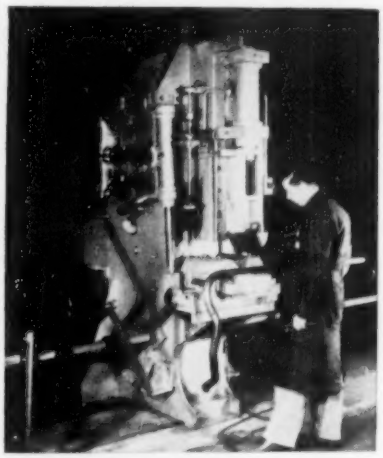
acteristics. The solenoids are sealed in glass and the valve construction is of stainless steel and aluminum.

Valcor Engineering Corp., 314 Market St., Newark, N. J.



Tube Bender

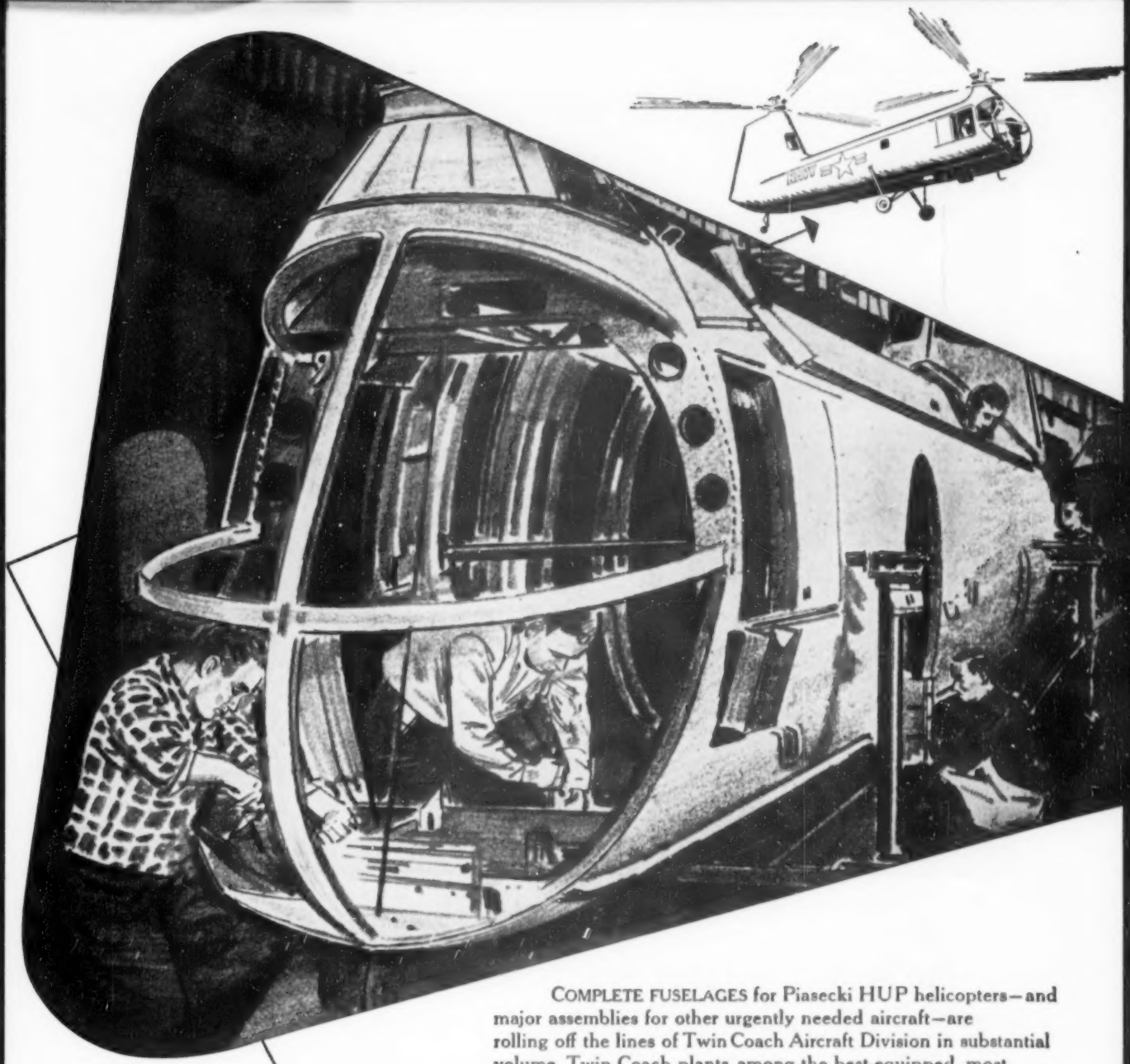
New tube and bending press is designed to provide greater working clearance to speed handling of a variety of multiple bends in different planes.

The machine, a vertical ram type, is rated for 20-ton capacity. It is hydraulic in operation and features twin equalizing cushion cylinders offset on the press frame, automatic angle-of-bend cycling and return to starting position, variable speeds and shortened die holders for better clearance. The unit bends steel tubing with outside diameters from ½ in. to 2 in., with maximum wall thickness of .083 in.

Pines Engineering Co., Inc., Aurora, Ill.

Mobile Leak Tester

A mobile manometer leak test machine, tailored for final testing of complete fuel and hydraulic systems in aircraft, has been developed by Device Engineering Co. The equipment works



COMPLETE FUSELAGES for Piasecki HUP helicopters—and major assemblies for other urgently needed aircraft—are rolling off the lines of Twin Coach Aircraft Division in substantial volume. Twin Coach plants, among the best-equipped, most modern in the nation, are competently staffed by men who are the real early birds of the aviation industry. Many have over 25 years of unbroken aircraft experience. Modern facilities, modern equipment plus *experienced* manpower make Twin Coach a dependable source for every type of airframe assembly.

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Twin's Early Birds Build Whirly Birds

Joe Sacco, lofting leadman, constructed and flew his first glider in 1929 while still attending Buffalo Technical High School. He has been in the aircraft industry continuously ever since.

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In 1934, when American Airlines issued the first credit card, proposed by C. R. Speers, an American sales manager, there was an immediate expansion of passenger traffic in the first class air travel field.

Up to then, all tickets had to be purchased by cash. This was a decided disadvantage to businessmen who found it necessary to carry large sums of money with them when they flew from one destination to another on an extended business trip. Credit cards developed customers for the airlines from firms who had not previously encouraged their personnel to fly on company business. Airline credit cards have become so popular and are now so widely used that they are accepted as evidence of credit at leading hotels and drive-your-self automobile agencies throughout the entire country.

The first issuance of credit cards is only one of many milestones in the history of air transportation introduced by American Airlines.

AMERICAN AIRLINES INC.
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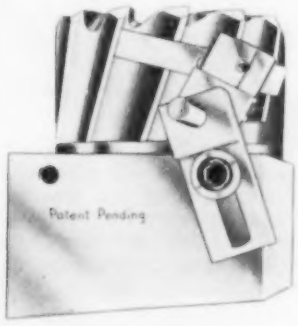
on the fall-in-air-pressure principle.

It can detect minute leaks in complex or inaccessible systems, the company claims, and may be used for check-out of pressurized cabins.

The tester boasts close pressure regulation, attributable to a new arrangement of pilot-loaded free diaphragm regulators, one for pressure reduction, the other for relief. Settings of both regulators are always in step, the company says.

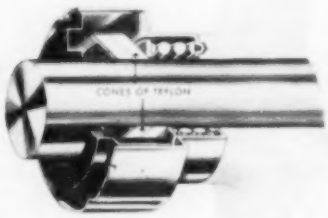
Device Engineering Co., 1701 Walnut St., Philadelphia 3, Pa.,



Grinds Mill Cutters

Better sharpening in less time is claimed with new grinding fixture for teeth of shell mills, side teeth of side-milling cutters and inserted-tooth milling cutters. Fixture converts surface grinder into cutter grinder; also can be used on cutter grinder.

Originally developed for company's own use, fixture is now being marketed by Westcott Chuck Co., Oneida, N. Y.



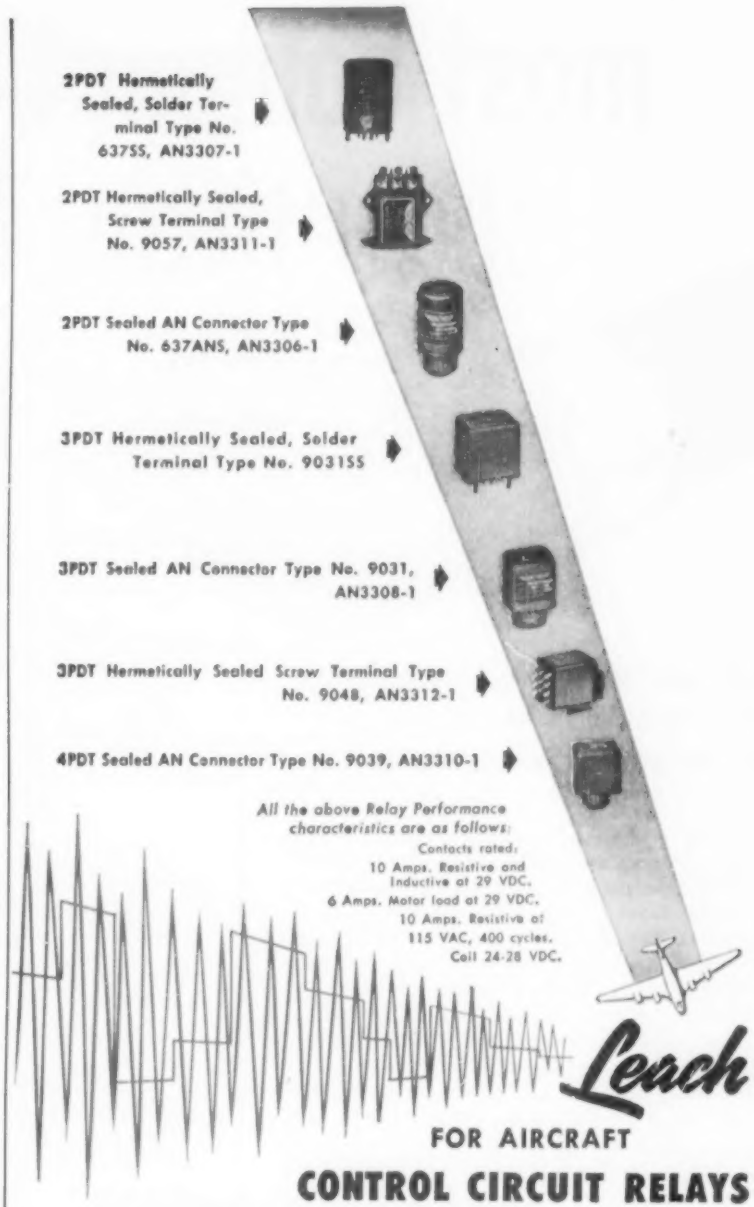
Shaft Seal

A mechanical seal for shafts operating at high speed in small pumps and other rotary applications has been announced.

The seal uses beveled cones of Teflon (du Pont) as the flexible member bearing against the shaft. It is suitable for —100 to 450F service, in vacuum systems and under pressures up to 200 psi. It withstands oils and acids.

Housings in stainless steel or other metal can be supplied with the part. Seal is made in sizes to fit shafts of $\frac{1}{4}$-$\frac{3}{8}$-$\frac{1}{2}$-$\frac{5}{8}$ and $\frac{3}{4}$-in. diameter.

Crane Packing Co., 1800 Cuyler Ave., Chicago 13.


2PDT Hermetically Sealed, Solder Terminal Type No. 6375S, AN3307-1
2PDT Hermetically Sealed, Screw Terminal Type No. 9057, AN3311-1
2PDT Sealed AN Connector Type No. 637ANS, AN3306-1
3PDT Hermetically Sealed, Solder Terminal Type No. 9031SS
3PDT Sealed AN Connector Type No. 9031, AN3308-1
3PDT Hermetically Sealed Screw Terminal Type No. 9048, AN3312-1
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All the above Relay Performance characteristics are as follows:
Contacts rated:
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6 Amps. Motor load at 29 VDC.
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FOR AIRCRAFT

CONTROL CIRCUIT RELAYS

Hermetically Sealed and Sealed

AN, AF AND NAF APPROVED: Illustrated above are but a few of the *complete* line of *Leach* hermetically sealed and sealed control circuit relays for aircraft.

Here are four of many important reasons why major aircraft manufacturers specify Leach relays: (1) to protect their product reputation, (2) to reduce maintenance costs, (3) for lasting dependable performance, and (4) because they're built to exacting standards.

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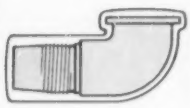

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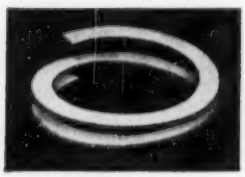

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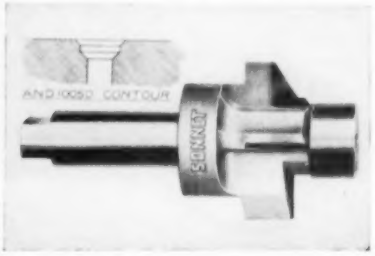

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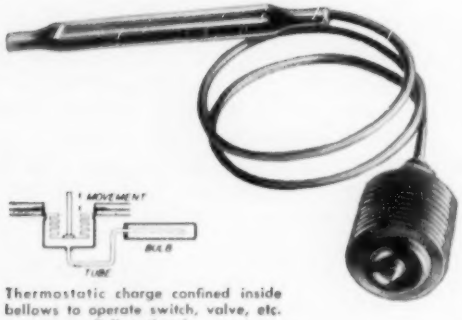

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Board May Delay Nonsked Action 2 Years

- **CAB wants to continue investigation of irregular carriers 18-24 months before handing down decision.**
- **Third round of hearings is scheduled to open next month in Miami with testimony of large carriers.**

By Lee Moore

Little change in Civil Aeronautics Board policy on regulation of nonsked airlines appeared in prospect last week as the Board closed the second round of Washington hearings on its "large irregular carrier investigation." CAB proposed to continue the proceeding another 1½ to 2 years before making a decision.

The Board will hear first testimony from the larger domestic nonskeds in this case at Miami, where hearings are slated to resume about May 1. Next scheduled appearances: Modern Air Transport, Peninsular Air Transport and Southern Air Transport.

In Washington, Transocean Air Lines and Trans-Caribbean Airways finally proposed international programs, but neither the Board itself nor the larger domestic nonskeds will propose for debate a new plan of CAB regulation. Thus far, the case continues as a fact-gathering investigation rather than a case to decide new policy—the ultimate aim when the case started six months ago.

New developments as hearings close in Washington:

• **CAB staff changed plans** to present a rebuttal witness to economic arguments made thus far by both scheduled and nonsked carriers. This witness would have given a tipoff on how the present Board views the problem of nonsked vs. sked competition and regulation. Nor has counsel for Bureau of Air Operations indicated whether it will take the stand before briefs to the examiners are filed (next year). Nonskeds are anxious to get CAB views so they will know what to argue about. As it stands now, the case is a mere presentation of facts for the record.

• **Some small nonskeds** that have appeared so far have proposed plans of their own for more liberal and less vague regulation than the present setup. They generally proposed limitation of from 8 to 10 flights a week between pairs of cities.

• **Big domestic nonskeds** generally refuse to propose new restrictions on grounds they might limit automatically chances of certification and of more free-enterprise rights, if and when CAB ultimately comes to decide a new policy.

• **CAB enforcement action** against nonskeds (for flying more often than present regulation permits) continues unabated. Latest move: enforcement proceedings against the North American group for alleged circumvention of Board regulations by grouping several carriers with one sales agency.

• **Federal courts** recently upheld CAB power to restrict carriers to any business volume it chooses, so long as the Board first holds proper hearings. Air Transport Associates, Seattle-Alaska nonsked, is scheduled to go out of business Apr. 24, following approval by the Supreme Court of CAB revocation of ATA operating rights.

• **Two international nonskeds** proposed that the Board lift its ban on passenger carriage by nonskeds in international operation. Their plans generally proposed frequency limits about the same as now permitted domestically, but with some extra allowances.

• **CAB hasn't acted** on the examiner recommendation to dismiss Seaboard & Western Airlines for failing to appear simultaneously in the nonsked investigation and in its re-opened (after six years) trans-Atlantic cargo case application for certificate. Board dismissal for this technical failure automatically would revoke operating authority of the largest U. S. trans-Atlantic all-cargo operator. The Board then would have to turn around and issue a special exemption to Seaboard to carry cargo.

• **CAB has not acted** either on examiner-recommended dismissal of four nonskeds from the previous Miami hearings for failing to present requested evidence. The case proceeds without them, pending CAB action. The four are Aero, Argonaut, Continental Charters and Miami Airlines.

▶ **Case Schedule Indefinite**—CAB originally planned for the nonsked case to start in Washington, move to Miami and Los Angeles, and conclude in Seattle. Now it has been back and forth between Washington and Miami twice, and observers are betting it will return to Washington again. However, the examiners report that timewise the case is "on schedule."

Meanwhile, two new plans were submitted to the Board by international nonskeds to compromise the twin extremes of unrestricted competion and a closed shop for prewar certificate owners:

• **Transocean** proposed that true international charter operations unrestricted as to frequency and that common carriage range from three to six trips a month between any two points in the world. Transocean president Orvis Nelson proposed that upward flexibility in frequency limits be geared to scheduled airline business volume. Nonskeds now are prohibited from any flying passengers on international routes. The carrier said CAB and foreign governments should grant these rights to carriers who can qualify as to "fitness" for CAB certification.

• **Trans Caribbean** president O. Roy Chalk proposed a total maximum mileage limitation of 120,000 miles for an international nonsked certificate, and restriction to six round trips per month between the home base and any of six foreign zones of the world. Trans Caribbean also said nonskeds must demonstrate "fitness" by minimum equity capitalization of $250,000, and operation of at least two aircraft.

▶ **CAB Nonsked Problem**—CAB started this "large irregular carrier investigation" to find a new regulatory policy that would permit independent airlines to expand business without risking price-cutting competition with already-certificated airlines.

The Board opened the case after the Senate Small Business Committee accused CAB of trying to regulate the nonskeds out of business. The Board included individual applications of all nonskeds because a federal court ruled against a CAB regulation restricting nonskeds to only three trips a month, holding that it amounted to confiscation of the business without adjudicatory hearing. Present hearings of individual carriers are designed to grant due process of law to all remaining nonskeds with letters of registration and to search for a more concrete economic policy than the present regulation, which CAB passed before nonskeds started aircoach operation and scheduled airlines joined in on it.

Positions of CAB, nonskeds, sched-

Civil Aeronautics Board Calendar

Examiner hearings, economic:

- **Large irregular carrier** policy investigation 5132, terminate in Washington mid-April, proceed to Miami two weeks later (address not yet designated), thence to Los Angeles, Seattle, and return to Washington. Examiners Richard Walsh and Ralph Wiser.
- **Trans-Atlantic cargo case** 3041 et al, in progress. Herbert Bryan.
- **Braniff Airways** mail rate 5142, resumes Apr. 16. Barron Fredericks.
- **Portland-Seattle** service case 2901 et al, Apr. 28. Merritt Ruhlen.
- **General passenger fare** investigation 5509, May 1. Merritt Ruhlen.
- **Tariff liability investigation** 4059 et al, May 6. James Keith.
- **South Pacific Air Lines** Hawaii-Society Islands route case 5849, May 12. Curtis Henderson.
- **Trans-Pacific route renewal** case 5031 et al, June 1. Thomas Wrenn.
- **West Coast-Hawaii** route case 5589 et al, June 22. Thomas Wrenn.
- **U. S.-Alaska** route case 5756 et al, July 7. Francis Brown.
- **Alaska Airlines** mail rate 2021, Aug. 3. Edward Stodola.

Hearings, accident investigation:

- **Transocean Air Lines** DC-4 near Alvarado, Calif., SA-274, Leamington Hotel, Oakland, Apr. 16. Presiding officer Van R. O'Brien.

Oral arguments before Board, economic:

- **Trans-Texas Airways** route segment renewal 5233 et al, Apr. 21.
- **Continental Air Lines** Wichita Falls-Dallas service 3094 et al, Apr. 30.

Oral arguments before Board, safety enforcement:

- **Propeller Service Corp.** maintenance certificate revocation SR1-766, Apr. 16.

General:

- **Policy speech**, CAB Member Joseph Adams, Oakland Chamber of Commerce, Apr. 15.

uled airlines in the irregular carrier investigation.

▶ **Domestic Operation**—Common carriage is restricted to "infrequent and irregular flights," which CAB interprets as anything from five to 10 flights a month between two cities, regardless of number of planes the carrier operates.

Nonskeds' government contract volume is not restricted by the Board's economic regulation. Defense Department recently re-affirmed its policy of letting air transport contracts to the lowest responsible bidder, regardless of whether CAB had revoked the carrier's letter of registration for flying too much.

Small one-plane nonskeds asked CAB to define "infrequent" trips as up to 12 a month, at least, and they ask the Board to lift its requirement of "irregularity" of scheduling. At present, even four flights a month can count as too regular if all flights are on the same day of the week.

Big nonskeds asked CAB to follow the recommendation of the previous (Sparkman) Senate Small Business Committee recommendation that "infrequent" trips be defined as at least 14 or 15 a month and that the ban on regular scheduling be lifted. The large operators also urged application of the regulation on a per-plane instead of per-carrier basis to permit some normal business incentive to expand service.

▶ **International Operation**—Present CAB policy on international nonskeds prohibits passenger operation entirely, including charters such as student, club, civic and business tours. Freight is restricted to "infrequent and irregular" flights. But a maze of special government contract and exemption flights clouds the international freight frequency definition. Government contract flights are permitted on both passengers and freight; government agency contract awards are beyond CAB economic jurisdiction.

International operators asked passenger rights similar to those granted domestic nonskeds. On freight, most of them have applications in the current (re-opened) trans-Atlantic cargo case.

▶ **Domestic and International**—Scheduled airlines urged CAB to restrict nonskeds to contract flights only.

Nonskeds asked permission to stay in and expand whatever line of air carriage they started and developed.

Civil Aeronautics Act leaves it up to the bi-partisan Board to exempt or certificate airlines CAB believes will serve the "public convenience and necessity."

Associations May Merge

Air Coach Transport Assn. recently proposed merger with Independent Military Air Transport Assn.

The two organizations presently coordinate procuring military air charter contracts through a joint control board. ACTA has 39 carriers and operates about 60 field offices, mostly at or near Army and Naval bases. IMATA represents 14 carriers and procures Air Force and Marine business.

Pacific Aircoach

- **Plane travel to Hawaii now double ship traffic.**
- **PAA and United carry 17,400 in four months.**

Air travel to and from Hawaii and the U. S. mainland, with a recent sharp jab from low-cost aircoach fares, has created a series of interesting phenomena.

Surprisingly, introduction of tourist flights by Pan American World Airways between the U. S. mainland and Hawaii last Dec. 1 has caused no serious diversion from its regular first-class business over the same route.

Pan American and United Air Lines account for the bulk of all air traffic moved in this area. In recent years, according to available figures, United carried more passengers between Hawaii and the U. S. mainland than Pan American.

This lead now has been threatened by Pan American's earlier start with aircoach service. However, United inaugurated its own tourist service Mar. 22 and is making a strong bid to overcome Pan American's initial advantage in the field.

▶ **Same Fares**—Pan American's tourist service has been highly successful. For the four-month period ended Mar. 28, a total of 8,347 passengers were carried in this lower-fare service. During the same period, 9,089 passengers used Pan American's first-class service. In contrast, during the same approximate period a year ago 9,674 passengers flew over the same routes in the first-class service. It is reported that Pan American's introduction of aircoach has had some but not a serious diversionary effect on United.

An interesting test as to diversionary impact and the creation of new traffic by tourist schedules will now be at hand with both carriers providing comparable competitive services. United, however, is flying DC-6s with a 69-seat configuration with two-abreast seating. Pan American is flying the Stratocruiser with an 81-seat configuration in a series of three-abreast seating arrangements. The aircoach fare is the same for both carriers, $125 (excluding tax) one-way, against a first-class tariff of $168.

Ironically the influx of traffic by air has caused a serious shortage in hotel facilities. In many other noted resort areas, such as Miami, special promotional air fares have been developed in conjunction with hotel interests to stimulate business to fill up hotel rooms during off-season periods. In Hawaii, the exact reverse is true. Lack of hotel

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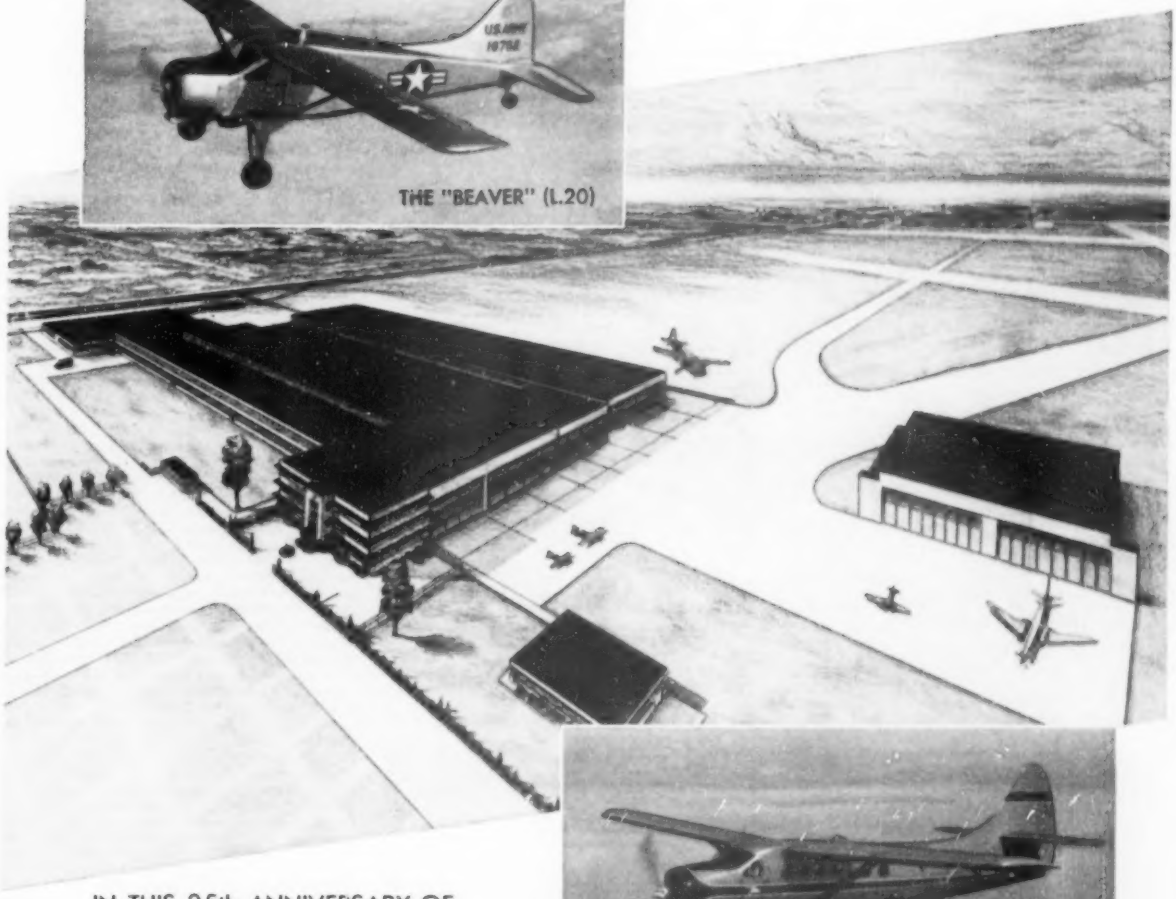

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accommodations is proving to be a serious limitation to air traffic.

▶**Matson Interest**—For this reason, Honolulu is now on the verge of embarking upon one of the greatest hotel building booms of its history. For example, present hotels in Honolulu have a total of about 1,500 rooms. New construction definitely under way should add 410.

Further irony lies in the fact that the Matson steamship interests, whose ship traffic has suffered as a result of air transportation, are at the same time one of the leading beneficiaries in another direction. The Matson interests own the three leading hotels, the Royal Hawaiian, Moana and Surfrider, with a combined capacity of about 700 rooms—filled largely by air travelers. The Matson management was well advised in its attempt to obtain a certificate for air operation from the CAB, though the effort failed.

Of interest is the fact that the Lurline, Matson's luxury ship, was rebuilt after the war at a cost of more than $18 million. This ship can accommodate 722 passengers and makes the trip from the U. S. to Hawaii in 2½ days. A DC-6, costing about $1 million, transports about 70 passengers in less than 10 hours. The flexibility and economy of air transportation thus becomes self-evident.

▶**Impact on Hawaii**—That ship travel is rapidly losing ground to air transportation is no longer in doubt. During 1950, a total of 22,214 ship passengers visited Hawaii from the U. S. compared to 25,182 by air. For 1952 only 15,140 went by boat, 34,392 by air. As air-coach schedules are augmented, this disparity should widen even further.

Air transportation is having a big impact on the economy of Hawaii. First in importance to Hawaii is its sugar industry, closely followed by pineapple production. Tourist business, now third, is moving up rapidly. As more accommodations are made available, it is likely that in time tourism—largely stimulated by aircoach traffic—may become the prime industrial asset of the Hawaiian Islands.—**Selig Altschul**

Two Big 4 Airlines Report Top Salaries

American Airlines and Trans World Airlines have reported top executive salaries and stockholdings for 1952 in reports to Civil Aeronautics Administration.

The AA report shows president C. R. Smith received $63,064, or about $8,000 more than in 1951. Vice president and director O. M. (Red) Mosier's $37,145 was about $3,000 more than a year ago, and most other top executives got similar increases.

TWA reported president Ralph Damon was paid $157,407 in 1952, nearly $50,000 more than in 1951, and chairman Warren Lee Pierson received a $5,000 increase to $95,844. Other executives got raises averaging $2,000 each. Hughes Tool's ownership of 74% of TWA did not change materially.

American Airlines

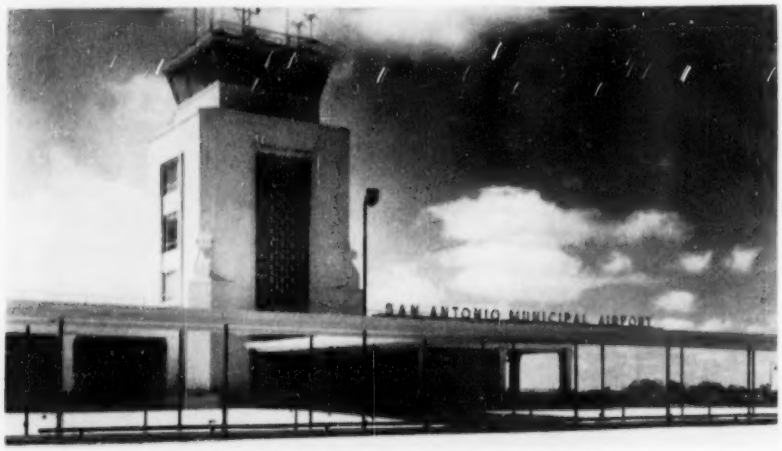
Here are American Airlines salaries reported for 1952, with comparable 1951 figures in parentheses (no bonuses or other compensations were reported separately for 1952, but all received bonuses in 1951):

C. R. Smith, president and director, $63,064 ($49,482 and $2,051), owns 10,000 (4,000) shares common stock; O. M. Mosier, vice president and director, $37,145 ($32,792 and $1,653), owns 4,500 shares; R. E. S. Deichler, vice president, $35,000, ($32,792 and $812), owns 450 shares; Lawrence G. Fritz, vice president, $35,000 ($32,792 and $1,653), has 200 shares beneficially (owned 400 shares); W. J. Hogan, vice president and treasurer, $37,145 ($32,792 and $1,207); William Littlewood, vice president, $20,000 ($25,833 and $1,382), owns 4,300 shares (5,000); C. W. Jacob, vice president, $37,145 ($32,792 and $969), 20 shares of preferred; R. W. D. Smith Jr., vice president ($23,896 and $1,074); G. J. Brandewrede, vice president, $29,032 ($26,396 and $1,236); G. K. Griffin, vice president $22,000 ($18,621 and $637), owns 500 shares common; Miss Carlene Roberts, vice president, $25,000 ($27,792 and $1,216), own 100 shares; W. H. Johnson, secretary, $19,270 ($14,563 and $257); P. G. Larie, comptroller and assistant treasurer, $18,112 ($16,838 and $828), owns 200 shares common; T. L. Boyd, assistant vice president, $22,000 ($20,478 and $574), owns 50 shares; G. E. Market, assistant secretary, $12,612 ($11,647 and $407), owns 200 shares; C. R. Speers, assistant vice president, $22,000 ($20,000 and $605), owns 3,000 shares and has 200 (none) shares beneficially; M. Whitlock, new assistant vice president, $18,000 ($15,963 and $336); E. O. Schroeder, assistant vice president, $15,837; L. E. Glasgow, assistant comptroller and assistant treasurer, $17,112 ($15,838 and $584); V. J. Long, assistant secretary and assistant treasurer, $15,612, ($14,338), has 50 shares common and 10 preferred beneficially; W. L. McMillen, assistant secretary and assistant treasurer, $15,612 ($15,000 and $455), owns 320 (220) shares common and 30 preferred; M. L. Rinehard, (new) assistant treasurer, $17,126; A. A. Paradis, assistant secretary, $10,612 ($9,558 and $220); A. R. Bone, Jr., regional vice president, $16,500 ($14,463 and $448), has 1,100 shares common and 55 preferred beneficially; W. N. Bump, regional vice president, $16,500 ($14,463 and $424), owns 500 common; T. P. Gould, regional vice president, $16,500 ($14,578 and $589), owns 100 common; S. G. King, $16,500 ($14,463 and $609), owns 350 (250) common and has 250 common and 25 preferred beneficially; M. D. Miller, regional vice president, $16,500 ($14,463 and $638), owns 1,500 common and 30 preferred and has 1,600 common beneficially.

Directors: Harold T. Ames, fees $900 ($1,000), owns 3,000 shares and has 2,000 shares beneficially; Harry E. Benedict, $1,000; owns 2,100 shares; James Bruce, $900, owns 1,100 shares; Edward H. Butler, $700 ($400), owns 1,250 shares; Amon G. Carter, $700 ($800), owns 50,000 shares; Charles S. Cheston, $900 ($1,300), owns 400 shares; T. M. Conroy, $1,000 ($1,300), owns 200 shares and has 500 (none) beneficially; James Douglas, Jr., $400 ($600), owns 1,000 shares; Silliman Evans, $500 ($400), owns 100 shares; John W. Farley, $1,000 ($800) and has 200 (none) shares beneficially; Charles T. Fisher, Jr., $300 ($800), owns 1,000 shares; James A. Jackson, $1,000 ($700), owns 200 shares; A. N. Kemp, $400 ($600), owns 2,500 shares; R. W. Miller, $500 ($400), owns 1,000 shares; Edgar M. Queeny, $600 ($500), owns 15,000 common and 1,000 preferred.

Persons and organizations other than company officials receiving more than $10,000 are: Alvord and Alvord, Washington, $41,235 ($15,940) for special, professional, legal and technical services;. Raymond Buck, Ft. Worth, $12,000 legal; Covington & Burling, Washington, $162,725 ($159,300) legal; Debevoise, Plimpton & McLean, New York, $178,500 ($123,500) legal; McKinsey and Co., New York, $10,000 special, professional and technical; Naess and Murphy, Chicago, $20,985 engineering; Joseph P. Nuzzi, New York, $65,669 ($71,051), hauling; Arthur Young & Company, New York, $62,750 ($38,075) public accountants.

Options: of 128,700 share options at $11.70 per share and 102,770 at $12.50 for executives, and the 195,492 for employe (revocable) purchase at $12.50, none of the



NEW TERMINAL FOR SAN ANTONIO

A new sight for visitors at San Antonio Municipal Airport, Tex., is the terminal building, which, with fixtures and improvements, cost $1.2 million. Included are a children's nursery and an underground conveyor belt system for handling baggage from the building to the aircraft. The structure has been designed so that each area can be expanded. Radar equipment is scheduled to be installed in the tower at a later date. Architects for the project were Ayres & Ayres.

options outstanding amounted to 5% of total under option Dec. 31, 1952, except that of C. R. Smith, whose option has a remaining balance of 44,000 (50,000) shares.

Trans World Airlines

Here are compensation and stockholdings of all Trans World Airlines officials for 1952, with comparable 1951 figures shown in parentheses:

(Counsel for the CAB Rates Division has indicated that part of the payments to chairman Pierson and president Damon might be deducted from TWA's international mail pay.)

Ralph Damon, president and director, salary $85,000, other compensation $72,407 ($26,838), owns 3,300 (2,500) shares common stock; Warren Lee Pierson, chairman of the board, salary $69,925 ($65,000) and other compensation $25,919 ($25,335), owns 3,960 (2,600) shares common; J. A. Collings, executive vice president and director, salary $48,000 ($45,625), other compensation $20,303 ($20,585), owns 1,101 (801) shares; E. O. Cocke, vice president-sales, and director, salary $30,000 ($28,020) other compensation $13,124 ($13,394), owns 1,143 (706) shares; T. K. Tavior, vice president, salary $19,187 ($14,937), other compensation $3,861 ($2,942), owns 43 shares; G. L. Gilmore, vice president, $16,458 ($14,583), other compensation $3,568 ($3,200); D. W. Harris, vice president, salary $17,958 ($15,770), other compensation $3,600 ($2,977); G. H. Clay, secretary, salary $19,458 ($17,812), other compensation $5,983 ($6,153), owns 685 (400) shares; M. J. Plodinec, controller, salary $17,491 ($15,562), other compensation $3,679 ($3,093), owns 49 shares; J. L. Weller, vice president, salary $15,374, other compensation $2,829, owns 43 shares; E. M. Constable, treasurer, salary $18,958 ($14,937), other compensation $4,389 ($3,270), owns 50 shares (none).

Other directors: Fred W. Ayers, compensation $652 ($511); Palmer Bradley, $1,052 ($911); Powell Crosley, Jr., $551 ($211), has 1,120 shares beneficially; Noah Dietrich, $552 ($111); A. B. Eisenhower, $652 ($811), owns 120 (120) shares; Oscar F. Holcombe, $952 ($511); A. V. Leslie, $3,816 ($411), owns 300 (600) shares; Sidney Maestre, $1,152 ($811), owns 151 (120) shares; Harry Rogers, $1,352 ($1,011); S. D. Simpson, $1,352 ($1,011) owns 151 shares; Thomas F. Slack, $552 ($211); N. S. Talbott (deceased), $545, owned 120 shares; Lloyd Wright, $552, ($411), owns 240 shares.

Persons and organizations other than TWA officials receiving compensation of more than $10,000 for the year are: Chadbourne Parke, Whiteside, Wolff & Brophy, $333,500 ($265,000) for legal counsel; Clifford & Miller, $25,000 for legal services; Haskins & Sells, $47,445 ($51,188) for auditing services; Reed, Smith, Shaw & McClay, $20,350 ($17,800) for legal services; Airport Medical Center, Los Angeles, $13,073 ($13,866) for medical services; Batten, Barton, Durstine & Osborn, $18,710 ($69,027) for advertising services; Hal Leyshon & Associates, $24,546 for public relations services; Garth A. Sharp and Tom Ward, Jr., $22,900 for flight training services; Universal Advertising Agency, $20,578 ($16,930) for advertising services.

Of the 7,600 shares of common stock called for by options, those options for more than 5% are: Warren Lee Pierson 1,577 (1,800); Ralph S. Damon 1,577 (1,800); John A. Collings 1,051 (1,200), A. V. Leslie 789 (900); E. O. Cocke, 789 (900); Clarence E. Fleming 400 (600); George H. Clay 526 (600); Eric M. Constable 223 (216); M. J. Plodinec 223 (216); Thomas K. Kaylor 223 (216) and J. L. Weller 222 (215).

Hughes Tool Company controls TWA with ownership of 2,251,038 shares or 74% of total outstanding TWA stock, as of Dec. 31, 1952. At Dec. 31, 1951, Hughes' 1,783,828 represented 73% of the stock. TWA issued a stock dividend of one-tenth share for each share owned as of last Dec. 15.

No other stockholder has 5% or more of total TWA stock.

Nonsked Role

- **CAB terms the irregulars supplementary carriers.**
- **Ryan says they cannot compete with trunklines.**

Chairman Oswald Ryan defended Civil Aeronautics Board's policy of keeping nonscheduled airlines in a "supplementary" role in air transportation at sessions before two congressional committees, which drew record industry audiences. Congressional interest was slight.

The committee set Apr. 22-24 for follow-up hearings.

At the House Interstate and Foreign Commerce Committee hearing, the only critical questioning was by Rep. John Heselton.

He developed the Board's mis-statement, made in refusing certification for all-cargo trans-Atlantic flights in May 1952, that the Defense Department was not interested in such service (AVIATION WEEK June 30, 1952). Defense Department had expressed its interest in a letter of January 1950. Ryan said the letter was unknown to members of the Board at the time and was a factor in the CAB decision to re-open the case.

Heselton raised the question that the letter might have been willfully withheld and suggested an investigation to pin responsibility.

▶ **Alaska Air Service**—Rep. Thomas Pelly, who has indicated sympathy with the nonsked position, appeared satisfied with testimony by Joseph Fitzgerald, director of the CAB Alaska office, that air service now provided the territory is adequate. Although Ocean Van Lines, a major surface freight carrier to Alaska, ceased operations temporarily a few weeks ago, the additional traffic is "not taxing air service," he said.

The session with the Senate Small Business Subcommittee, was attended throughout by only one senator, Sen. Edward Thye. Sen. John Sparkman and Sen. Lester Hunt made brief appearances.

▶ **Continued Progress**—"This Board has sought earnestly and in good faith to find a place for the irregular carriers in the national transportation system which would strengthen and preserve this segment of the system and at the same time keep the way clear for the continued progress of the certificated industry toward the goal of a self-supporting transportation system," Ryan told both committees.

"But we have felt it to be our duty . . . to see to it that the irregular air carriers shall do the job which we authorized them to do and to supplement and not compete with the certificated air transport structure of the nation."

He reported:

- There are now 61 irregular carriers compared with only 39 domestic and international certificated carriers.
- The Board has not discriminated against irregulars in enforcement. From mid-1951 to the end of 1952, he said, 15 formal and 52 informal cases were initiated against certificated lines, compared with only seven formal and 48 informal case against the nonsked operators.
- Irregulars showed a profit before taxes of $4.4 million for the year ended June 30, 1951, and of $4.6 million for the year ended Sept. 30, 1952.

Nonskeds, meanwhile, made two counter-moves:

- Air Coach Transport Assn. general manager Hamlin Jonnston attacked CAB, declaring only 54 of the 175 large independent airlines operating when the Board opened its "elimination" campaign in 1948 still are in business. These are operating, he said, "only because the Defense Department uses their services for movement of military personnel." He called the Board's current investigation "a farce."
- ACTA issued reprints of a 1948 memorandum prepared by Louis Goodkind, then chief of the CAB's Bureau of Economic Regulations, declaring it "the master plan being followed by the Board to eliminate the nation's independent airlines by bureaucratic edict."

The memorandum stated: "It is conceded that there are certain limited and special services which can be conducted by large aircraft on a truly nonscheduled, irregular basis. These are the true fixed-base operations. . . . It is believed unwise, however, to keep the door open to such few operators and thus provide entry for a host of undesirables."

Senate Small Business Committee's recommendations, which were made last July, and Ryan's report on each, follow:

- Nonskeds should be allowed to have a minimum of 14 or 15 flights per month.

The irregulars can operate "30, 60, 90 or more flights per month, and no problem of economic minimums would exist" as long as the flights don't conflict with CAB policy on regularity, Ryan said. Irregulars are "encouraged and expected to operate to many points."

But 14 or 15 regular flights a month, he objected, "is a proposal by the irregulars to abandon or subordinate the field they were created to occupy and to enter instead upon new activities very similar to those of the certificated carriers."

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subsidized coach-type service should be granted.

"Even if it be assumed that the irregulars have 'pioneered' this type of service and have spurred the certificated carriers into belated efforts to catch up," Ryan warned, the diversion of lucrative long-haul traffic would increase the subsidy bill of the certificated carriers required to serve small non-lucrative points.

• The Board should not consider past regularity violations of nonskeds in weighing certification now.

In considering fitness and ability to engage in air transportation, the Board should consider violations of law as "one factor" but "not a bar to the grant of authority," Ryan said.

Pioneer Challenges CAB Martin Ruling

Pioneer Air Lines last week challenged the Civil Aeronautics Board decision forcing the carrier to sell its Martin 2-0-2s and buy back DC-3s. In a petition for re-consideration of the CAB decision, Pioneer said the $1,000,500 annual mail pay set by the Board last month is too low for DC-3 operation if the airline is to expand service.

The CAB ruling held that the Martins are not suited to local service routes and taxpayers should not underwrite a Pioneer experiment to prove 2-0-2s will be more economical than DC-3s on short-haul routes in the long run.

Pioneer's petition cited six major reasons why it believes CAB should increase the ordered $1-million annual subsidy:

• **Increased first-year payment** would be non-recurrent. Pioneer a year ago asked five-year pay of $5,732,000, increased it to $6,747,000 after six months of Martin operation, and finally asked $7,337,000 for non-recurrent integration problems. "During its first six months of Martin service, Pioneer . . . was completely unprepared for the sudden en-

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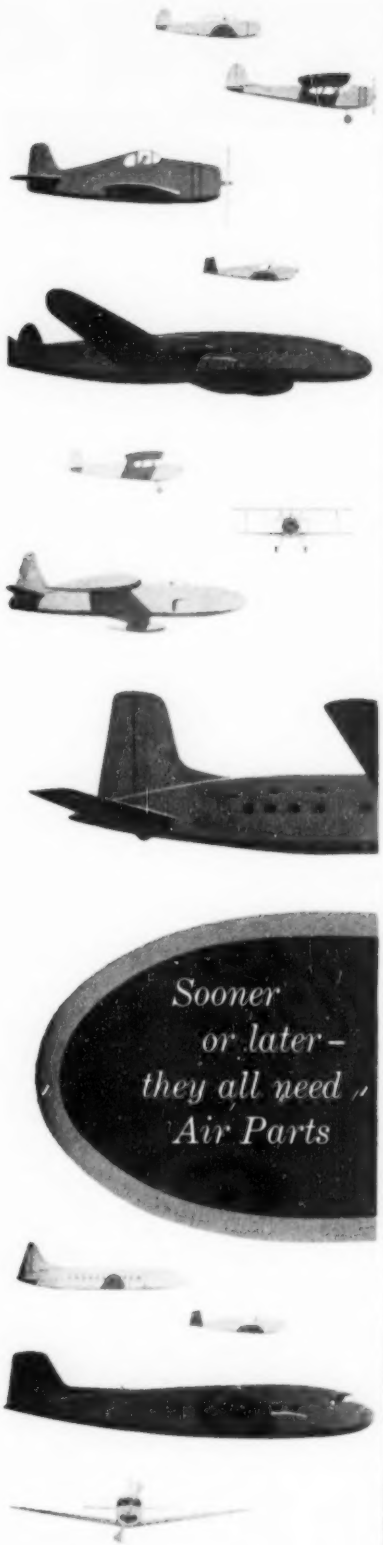

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gine failures which no airline management could have reasonably foreseen," the airline said.

• **DC-3 costs** "will continue well in excess of $1 million a year without any prospect of reduction."

• **Revised forecast for Martin costs** during the five-year period "set back Pioneer's timetable of progressive mail pay reduction by only one year."

• **"Only reasonable prospect** of economic self-sufficiency for Pioneer or any other local service airline lies in the conversion to other and more efficient equipment," Pioneer said. The Board previously has recognized this fact by supporting a proposed $8-million prototype appropriation for development of a new local service aircraft, Pioneer argued. The carrier said $8 million would only be a starter, and taxpayers would pay far more for prototype development before it started paying off through increased mail pay to local airlines buying and introducing the plane.

• **DC-3 service** of Pioneer cannot expand with demand unless the company increases its previous 11-plane fleet. But the present fleet of nine Martins can handle substantially more traffic "at constantly lower passenger-mile costs and constantly reducing mail pay requirements," Pioneer says.

• Martin costs are "commensurate" with expenses of the other local airlines' DC-3 operations. Pioneer cites its estimate of 1953 unit costs with Martins, compared to all DC-3 operators' average costs to Sept. 30, 1952:

Pioneer mail pay with 2-0-2s: $19.53 mail ton-mile, 1.69 cents per available seat-mile and 60.8 cents per plane mile.

DC-3 operators' mail pay: $21.57 mail ton-mile, 2.32 cents per available seat-mile and 46.62 cents per plane-mile.

SHORTLINES

▶ **Air Transport Assn.'s** freight agency—Air Cargo, Inc.—won out against American Trucking Assn., Inc., and the railroads in a hearing before Interstate Commerce Commission. Airlines kept their greater zoning freedom in freight pickup and delivery service.

▶ **American Airlines,** leading proponent for Civil Aeronautics Board switchover to use of sales profit margin instead of rate of profit return on investment in rate-making regulation, turned in a net profit margin of 6.6% on sales in 1952, compared with 6.5% in 1951. Revenues and expenses both gained 15%.

▶ **British Overseas Airways** plans to start its fourth international jet Comet serv-

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► **Civil Aeronautics Administration** reports Chicago, La Guardia, Washington National and Los Angeles airports led in airline operations volume during 1952, the same order as in 1951. San Francisco moved up one to replace Miami in fifth place. The 25 leading airports account for half of all CAA tower-controlled operations.

► **International Air Transport Assn.** has published a condensed record of the fifth IATA technical conference (Copenhagen) discussion of factors affecting final approach and landing. Book chapter headings are: Electronic Aids, Aircraft Performance, Aircraft Instrumentation, Visual Aids, Meteorological Requirements, Critical Heights, and Economic Aspects.

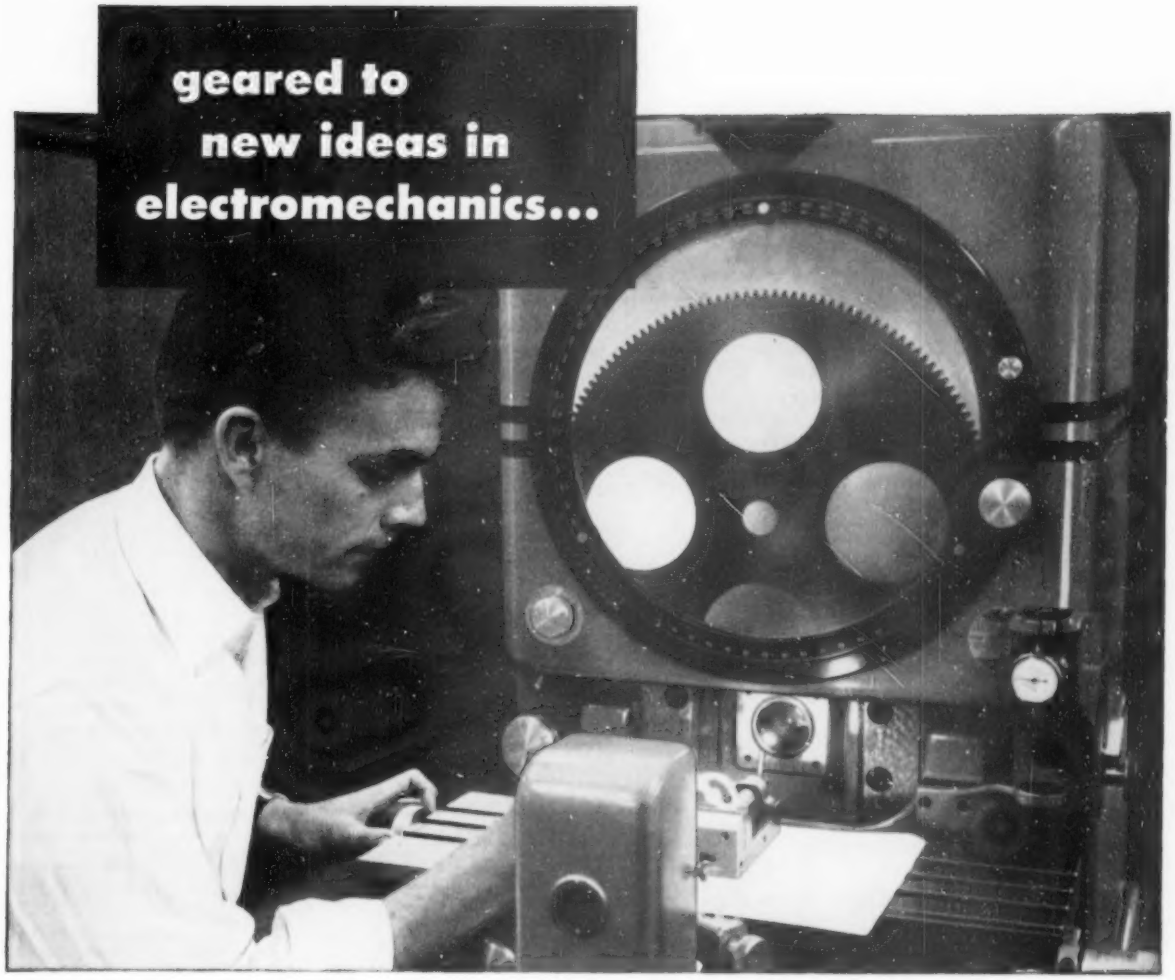
► **Northern Consolidated Airlines,** Alaskan company which resulted from 1947-48 mergers of seven operators, has CAB-proposed mail pay of $2,891,820 for Dec. 1, 1947 to June 30, 1952. Base rates thereafter: $1.76 a mile in summer and $2.70 a mile Nov. 1-Apr. 30. This is estimated to yield $1,345,642 a year, compared with $1,104,000 for fiscal 1952, $804,000 in 1951 and $326,000 in 1948.

► **Ozark Airlines** is recommended by CAB examiner Curtis C. Henderson for extension of Route No. 107 from Joplin, Mo., to Wichita, Kan., via Pittsburgh and Chanute, Kans.

► **Philippine Air Lines'** DC-6 and DC-6B fleet has achieved 8 hr., 14 min. average utilization per day, including time lost in major overhaul, interior modification and spar cap rework. Company received one DC-6B in June, another in August. Delivery of two of six Convair 340s ordered is scheduled for this month and June and two more before the yearend. Domestic DC-3 service lost money last year, but total operation yielded a 2½% net profit.

► **Seaboard & Western Airlines** has arranged $5-million conditional financing by Chase National Bank on its fourplane, $8-million Super Constellation order for 1954 delivery. Company says additional Connie financing plans are under study.

► **Trans World Airlines** survey shows TWA carries a higher proportion of women on trans-Atlantic flights than do other airlines. . . . Company now has a fleet of 155 planes: 68 Connies, 10 Super Connies, 52 Martins, 13 DC-4s and 12 DC-3s.



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10	15401-1	Eclipse	Amplifier (PB10) w/ED3 MOUNT
52	10078-1AG	Eclipse	Gyro Indicator
62	CQ-9	Eclipse	Clutch Switch (PB10)
11	12086-1C	Eclipse	Amplifier
19	15100-1B-A1	Eclipse	Pitch Trim Gauge
8	20000-43A-13A1	Eclipse	Magnesyn Indicator
67	23000-2A	Eclipse	Magnesyn Indicator
15	22101-11-A4	Eclipse	Pressure Trans.
6	2225-11C-3A	Eclipse	Dual Tach.
9	20100-428-14A2	Eclipse	Torque Ind.
9	20000-8A-14	Eclipse	Magnesyn Pos. Ind.
23	20100-11C-4-A1	Eclipse	Wing Flap Indicator
11	DW-33	Eclipse	Transformer
23	CQ-2	Eclipse	Switch Box
75	1195-4-A	Eclipse	Vibrator
80	DW-28	Eclipse	Transformer
11	2227-11-D3A	Eclipse	Tachometer
75	1416-12E	Eclipse	Starter
100	716-3A	Eclipse	Generator (NEA-3A)
384	564-2A	Eclipse	Oil Separator
71	8287TY13Z2	Weston	Oil Temp. Indicator
40	119862	Weston	Carb. Air Temp. Indicator
400	AN5780-2	Weston	Wheel & Flap Position Indicator
1000	AN5780-2	G.E.	Wheel & Flap Position Indicator
40	828TY12Z2	Weston	Dual Carb. Temp. Gauge
11	727TY70Z2	Weston	Air Temp. Ind.
85	727TY72Z2	Weston	Air Temp. Gauge
88	727TY73Z2	Weston	Air Temp. Gauge
83	727TY74Z2	Weston	Air Temp. Gauge
10	728-40Z2	Weston	Air Temp. Gauge
21	8DJ29AAY	G.E.	Cowl Flap Ind.
22	77C5	Lewis	Carb. Air Temp.
16	76B19	Lewis	Cyl. Head Temp.
23	77C3	Lewis	Oil Temp. Gauge
13	77C4	Lewis	Oil Temp. Ind.
30	47B21	Lewis	Free Air Temp.
33	47B22	Lewis	Air Temp. Gauge
28	47B23	Lewis	Air Temp. Gauge
54	47B24	Lewis	Air Temp. Gauge
22	906-6-011	Kollsman	Diff. Press. Gauge
48	254BK-6-052	Kollsman	Diff. Press. Gauge
33	DW-47	Eclipse	Transformer
46	117-47	Edison	Fire Detector
19	117-19	Edison	Control Box
200	981280	Kidde	CO2 Cylinders
43	966090	Kidde	Interconnector
104	966679	Kidde	Pressure Control
225	981591	Kidde	Tee
151	A-4614	Kidde	Switch
47	M870036B	Kidde	CO2 Cyl.
74	923748	Kidde	Oxygen Cyl.
326	982585	Kidde	Valve
325	AN60009-1B	Oh. Chem.	Valve
247	AN6009-2A	Oh. Chem.	Valve
47	2-1046-76	Parker	Valve (3000 PSI)
115	P4CA2A	Parker	Primer
68	SP4-2746-77	Parker	Restrictor Valve
105	SP4-2746-78	Parker	Restrictor Valve
68	6-746-10	Parker	Valve
40	SP4-2746-79	Parker	Restrictor Valve
48	SP-2746-80	Parker	Restrictor Valve
60	SP4-2746-81	Parker	Restrictor Valve
127	PL2-2546-75	Parker	ConeCheckValve
123	PL2-2546-76	Parker	ConeCheckValve
620	PL2-2546-77	Parker	ConeCheckValve
540	PL2-2546-78	Parker	ConeCheckValve
142	SP4-2746-76	Parker	Restrictor Valve
112	PLY-843-54	Parker	Check Valve
23	PL2-1846-77	Parker	Check Valve
120	MF9-713-15A	Vickers	Hydraulic Pump
124	PF12-713-25BCE	Vickers	Hydraulic Pump
10	PF9-2713-20Z2	Vickers	Hydraulic Pump
327	PF4-713-20BCE	Vickers	Hydraulic Pump
57	MF45-3911-20Z	Vickers	Hydraulic Pump (3000 PSI)
28	AA31400	Vickers	Valve
125	D7818	Adel	Anti-icer Pump
250	AN4014	Erie Meter	Wobble (D-3) Pump
45	AN4103-2	Clifford	Brass (Valve 4U4785) Oil Cooler

Quan.	Part No.	Mfg.	Description
70	AN3213-1	Scintilla	Ignition Switch
250	A-9 (94-3226)	Nesco	Ignition Switch
66	M862A	Jos. Pollack	Master Switch
148	PG208AS1	Honeywell	Switch Air Ram.
40	PG208AS7	Honeywell	Air Ram Switch
18	4582-AA-6C	Dynamic Air Eng.	Blower
24	U-702-15	Joy Mfg. Co.	Blower
20	V301B7	Aerotec	Pressure Relief Valve
419	450	Skinner	Filter
287	1033-4E1	White-Rodgers	Heater Control Switch
126	17322-2	Fenwall	Thermo Switch
34	9804B	Vapor Car Heating Co.	Control Box
25	46B311	Vapor Car Heating Co.	Compensator
202	A812	Interstate Aircraft & Eng. Co.	Solenoid
46	146102	Bendix	Valve (0-500 PSI)
240	1265-900	Airex	Relief Valve
29	HC2109	Air Associates	Hyd. Cylinder
8	HC2110	Air Associates	Hyd. Cylinder
53	AN6203-3	Bendix	Accumulator 10"-1500 P.S.I
90	JH950-R	Jack & Heinz	Starter Motor
140	K14949E	Marquette	Windshield Wiper Kit
188	EYLC-2334	Barber-Coleman	Control
230	921-B	Stewart-Warner	Heater (200000 BTU)
22	0655-D	Aro	Oxygen Regulator
65	ASDC2	CO2 Mfg. Co.	Fire Detector
97	6041-H-146A	Cutler Hammer	Relay (B-12)
237	6141-H69A	Cutler Hammer	Circuit Breaker
47	7964-404	Leach	Relay
22	M-2031	Air Associates	Actuator
11	FYLD2516	Barber Colman	Thermostat
51	AYLZ2284	Barber Colman	Micropositioner
20	72400	Ham. Stand.	Prop. Reversing Control
10	5X18	Woodward	Governor
46	A14-A-9708P	Westinghouse	Contractor
26	70G3	G.E.	Transformer
718	B2A	Square D	Relay
6	83A94	Surface Combustion Co.	Heater
115	C6363-1-5A	Spencer	Circuit Breaker
115	C6363-1-2A	Spencer	Circuit Breaker
33	18784	Adel	Restrictor Valve
1700	AM1614-80	Heinemann	Circuit Breaker
31	BOBX-2	Allied	Relay
85	12994-2	Adel	Lock Valve
405	58G926	G.E.	Ballast Core & Coil
140	58G946	G.E.	Ballast
40	7210-24	Leach	Relay
66	25432	Airesearch	Flex. Cable
518	MT48C	Bendix Radio	Insulato.
20	M-101-B	Aerotec	Pressure Switch
12	MT68EG	Bendix Radio	Mount
52	715E	Fulton Syphon	Temp. Control
478	D9530	Adel	Selector Valve
668	D9530-2	Adel	Selector Valve
428	D9560-2	Adel	Selector Valve
179	D9632	Adel	Selector Valve
237	D9696	Adel	Selector Valve
744	D10044	Adel	Selector Valve
244	D10051	Adel	Selector Valve
814	74247 (TY PH3)	Aero Supply	Valve
335	AN5830-1	Whittaker	Valve
74	AN5830-6	Whittaker	Valve
60	AN5831-1	Parker	Valve
130	612-4A	Eclipse	Valve
2200	37D6210 (AN4078-1)	United	Solenoid Valve
1888	K1593-6D	Kohler	Valve
500	NF3-5	Mallory	Noise Filter
20	TA-12B	Bendix Radio	Transmitter
35	RA10-DB	Bendix Radio	Receiver
2585	AN3096-4	Grimes	Dome Light
775	AN3096-5	Grimes	Dome Light
1365	AN3096-6	Grimes	Dome Light
6	610-2C	Eclipse	Vacuum Pump
550	PD12K10	Stromberg	Carburetor
236	PR48-A1	Stromberg	Carburetor
90	1685-HAR	Holley	Carburetor
19	1375F	Holley	Carburetor
407	SF9-LN-2	Scintilla	Magneto
185000	LS4-AD1	Aero	Spark Plug
1	R1820-52	Wright	Engine
16	R1820-54	Wright	Engine
4	R1820-60	Wright	Engine
1	R1830-43	P & W	Engine
166	1045A	P & W	Bearing
500	3506	P & W	Flange

Quan.	Part No.	Mfg.	Description
130	8288	P & W	Follower Ass'y.
814	35814	P & W	Blower Ass'y.
53	48362	P & W	Shaft
75	48363	P & W	Shaft
56	48392	P & W	Sump
390	48461	P & W	Gear
78	76236	P & W	Gear
1178	84289	P & W	Bearing
113	84487	P & W	Housing
77	84591C	P & W	Nose Housing
200	48350-D	P & W	Crankcase Ass'y.
200	84083	P & W	Cylinder
100	84084	P & W	Cylinder
200	84085	P & W	Cylinder
281	CR2791-G100-K4	G.E.	Relay
626	CR2792F101-A3	G.E.	Relay
41	G34464	Guardian	Relay
350	G31502-A	Guardian	Relay
22	146102	Vickers	Brake Valve
9	557-5	Eclipse	Check Valve
6	TFD-6500	Thompson	Pump
107	D12296	Adel	Pump
67	19100-2-101B	Kenyon	Check Valve
88	3135-11C	Eclipse	Pressure Switch
32	3V-917-HC	Pesco	Separator
100	27314	Purolator	Oil Filter
128	3801-3B	Eclipse	Fuel Quan. Gauge
33	420313	Wright Aero	Pump Ass'y.
46	416421	Wright Aero	Drive Ass'y.
76	U635A (AN4000-2B)	U.A.P.	Fuel Strainer
12	U8416-MM	U.A.P.	Oil Cooler Assy.
25	26675	Airesearch	Motor
35	AA14002A	Vickers	Accumulato
21	FD65-5	Diehl	Motor
81	3616	Bendix Radio	Control
23	3620	Bendix Radio	Station Box
335	G1 (94-32376)	G.E.	Oxygen Pressure Signal Ass'y.
180	AW-CV-1-1	U. S. Gauge	Check Valve
740	1C-200	G.E.	Radio Noise Filter
15	1EAR-280BH	Pesco	Pump
7	SP-1-445-8	Parker	Selector Valve
8	1E621	Pesco	Pump
29	NEP-2	Eclipse	Auxiliary Power Unit
16	LER-30D	Lawrence	Auxiliary Power Unit
4	2CM46A2	G.E.	Generator
6	2P248EB	Pesco	Fuel Pump
21	2E258SA	Pesco	Pump
146	AW2-3/4-25K	U. S. Gauge	Manifold Press Gauge (Metric)
27363	CREB3N	Casco	Rod End
18	SA-3A	Kidde	Impact Switch
13	3GBD1A18A	G.E.	Regulator
18273	AN200-K3L2	Fafnir	Bearing
245	LMR-4	Micro	Switch
2094	PM-5	Spencer	Circuit Breaker
44	5BA25D-J4B	G.E.	Motor
31	5AM31JJ9A	G.E.	Amplidyne
111	5AM31NJ10	G.E.	Amplidyne
425	5BA40NJ1A	G.E.	Motor
189	5PD65-MB1	G.E.	Motor
25790	NR6L12	Torrington	Bearing
26	MS49A	Bendix Radio	Antenna Switch
45	D2060	C. P. Clare	Relay
298	727-TY37P	Weston	Air Temp. Ind.
2000	8909-K99	C. H.	Switch
2747	NAF310310-4B	Cannon	Plug
402	NAF310310-5B	Cannon	Plug
132	AN6209-B	Hydro Aire	Valve
50	AN6213-2	Bendix	Hyd. Valve
280	AN6220-4	Aeroquip	Couplings
27	AN6247-2	Adel	Hyd. Valve
14	UA8013-MM	United Aircraft Prod.	Oil Cooler
1175	RS-2	Mallory	Selector Box
172	A7012	Delco	Motor
6	8DJ13ABK	G.E.	Tachometer Indicator
200	2222-1F-2A	Eclipse	Tachometer Indicator
28	AN5770-2	Manning Maxwell Moore	Manifold Pressure Gauge
71	1003-4	Eclipse	Generator
427	NAF1016-1	Adams & Westlake	Light Ass'y.
616	NAF1016-2	Adams & Westlake	Light Ass'y.
1008	1222BF	Leach	Relay
751	B1392T	Teleflex	Gear Box
130	B1194T	Teleflex	Gear Box

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LETTERS

Allisons & Cutlass

In your issue of AVIATION WEEK, Feb. 23, page 15, you showed a picture of the Navy's F7U-3 Cutlass. Your statement is true that the aircraft is designed for power from two Westinghouse J46 engines, but the aircraft in the picture is powered by two Allison J35 engines. The first sixteen F7U-3s are powered by Allison J35 engines because Westinghouse is better than a year late on delivery of their J46 engines. An F7U-3 has never been flown yet with a Westinghouse engine and probably won't be for several months yet.

I am sorry if I sound a little bitter, but I am tired of seeing Westinghouse engines being credited in the F7U-3 when Allison engines are doing the job.

J. W. RIDDLE
Allison representative at
Chance Vought Aircraft
Dallas, Texas

From Mr. Lederer

Thanks for the editorial March 23. AVIATION WEEK has always cooperated strongly with us on matters of flight safety, and your support has been very helpful.

There was one phrase omitted in connection with my remarks on Mr. Littlewood's talk. Where I comment on what safety means to different people, I also said: "To the lawyer, safety means that his wife will have to be satisfied with last year's mink!"

Perhaps you are not aware that many United States airlines and KLM are also contributing funds under the express condition that we would never accept funds that had strings attached to them! Earl Slick, aircraft manufacturers, oil companies, and accessories manufacturers are also helping us financially in our work.

The Cornell Guggenheim Aviation Safety Center complements the work of the Flight Safety Foundation by specializing in the field of education and research. This organization, due to the generosity of the Guggenheim Foundation, is also meeting with widespread approval within the industry.

JEROME LEDERER, DIRECTOR
Flight Safety Foundation, Inc.
2 East 64th Street
New York 21, N. Y.

Handley Page Gear

In AVIATION WEEK Dec. 22, you refer to the collapse of the landing gear on the Handley Page H. P. 80 bomber before initial flight tests, which kept it out of the Farnborough Show. This report was also published in your issue of Sept. 8.

As designers and manufacturers of this landing gear, we would like to make it clear that this report is incorrect, and that at no time has there been any form of collapse on this undercarriage.

In our efforts to achieve a minimum possible weight for this landing gear, we have carried out extensive performance and strength tests to insure that it has the required structural strength under all operating conditions. This has resulted in a complete landing gear having a weight of 3% of the aircraft all-up weight, and which has given complete satisfaction to the aircraft manufacturer.

In view of the false impression which may be created by your reports, we shall be glad if you will publish a correction.

C. B. V. NEILSON, Technical Director
Electro-Hydraulics Ltd.
Liverpool Road
Warrington, England

(AVIATION WEEK has rechecked since receipt of the letter above. Our informant abroad contends that the undercarriage collapsed after the prototype was shipped by road from St. Albans to Boscombe Down, and after it was re-assembled in August of 1952.—Ed.)

Lockheed's Giants

Our compliments to you and our thanks to you and staff for the fine story on Lockheed's "Giants." Irving Stone did his usual excellent work with the material, and I thought the layout especially effective.

BERT W. HOLLOWAY
Director advertising, publicity,
sales promotion
Lockheed Aircraft Corp.
Burbank, Calif.

Airports & Life

In the March 9 issue of AVIATION WEEK, you have written a brief editorial entitled "Airports, Life & Death" which I would like to reproduce in the publication of this commission. This reaches all Indiana pilots and aircraft owners on our list and is also mailed to other aviation commissions and departments in the country as well as interested out-of-state parties.

MISS ELIZABETH PETTITT
Chief, Special Services
Aeronautics Commission of Indiana
311 W. Washington
Indianapolis 4, Ind.

Praise

I enjoyed the article by Phil Klass on Carac in the Feb. 9 AVIATION WEEK. In fact, I can honestly say that I look forward to every issue of your excellent publication.

B. L. PFEFER
Application Engineering Section
Government Sales
General Electric Co.
Syracuse, N. Y.

Old Copies Available

I have the back issues of AVIATION magazine, from the time it was first published, and was a weekly magazine, up to about 1939. Would some collector want them?

MRS. WAYNE PARKER
Farnam, Nebraska

AVIATION CALENDAR

Apr. 15-16—First annual engineering management conference, Management Division of The American Society of Mechanical Engineers, Rackham Bldg., Detroit.

Apr. 20-24—Aeronautic Production Forum, National Aeronautic Meeting and Aircraft Engineering display (SAE), Hotel Governor Clinton and Hotel Statler, New York.

Apr. 20-May 2—Annual Conference of Technical Committee, International Air Transport Assn., Caribe Hilton Hotel, San Juan, Puerto Rico. Helicopter Symposium will be a principal feature.

Apr. 21-24—SAE Committee A-6, Aircraft Hydraulic and Pneumatic Equipment meeting, Governor Clinton Hotel, New York, N. Y.

Apr. 25-May 2—First annual National Transcontinental Handicap Air Cruise for private planes of 300 hp. or less, Philadelphia to Palm Springs, Calif., sponsored by Philadelphia Junior Chamber of Commerce.

Apr. 27-28—Iowa Thermodynamics Symposium, State University of Iowa, Iowa City.

Apr. 29-May 1—1953 Electronics Components Symposium (AIEE-IRE), Shakespeare Club, Pasadena, Calif.

May 6-7—Second annual Skylady Derby, sponsored by Women's National Aeronautical Assn., sanctioned by NAA and conducted under FAI rules. From Fort Smith, Ark., to Memphis, St. Louis, Kansas City and return to Fort Smith. WNAA's twenty-fourth annual convention will follow at Fort Smith.

May 8-10—Oklahoma City Air Fair, Will Rogers Field, Oklahoma City, Okla.

May 11-13—National Conference on Airborne Electronics, Dayton Biltmore Hotel, Dayton, O.

May 14-16—American Helicopter Society Forum, Mayflower Hotel, Washington, D. C.

May 15—Air Youth Day, Los Angeles International Airport.

May 16—Armed Forces Day, open house programs at local USAF, Navy, Army, Marine and Coast Guard installations.

May 18-22—Fifth National Materials Handling Exposition, Convention Hall, Philadelphia.

May 18-22—Aviation Seminar, National Fire Protection Assn. annual meeting, Palmer House, Chicago.

May 19-22—Annual convention Aviation Writers Assn., Ft. Worth, Tex.

May 20-22—IAS, AIEE, ISA and IRE joint National Telemetering Conference, Edgewater Beach Hotel, Chicago, Ill.

June 11-13—Fifth annual All-Women International Air Race, Weeland, Ont., to New Smyrna Beach, Fla., sponsored by Ninety-Nines, Inc.

June 17-19—Mid-year meeting of Aviation Distributors and Manufacturers Assn., Chateau Lake Louise, Alberta, Canada.

July 15-16—IAS Annual Summer Meeting, Honors Dinner. IAS Building, Los Angeles, Calif.

Sept. 7-13—1953 SBAC Coronation Year Flying Display, Farnborough, Hampshire, England.

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EDITORIAL

Col. Joseph Adams in a Marine Helicopter

A CAB Member Who Gets Around

Col. Joseph Adams is one Civil Aeronautics Board member who learns about air transport first hand. Board members have been criticized by the airline industry ever since CAB was set up in 1938 because they have regulated a very dynamic business from armchair and staff research memoes. Only a few members and chairmen have broken this ivory tower tradition.

Col. Adams not only came to the Board with a rich background of flying, but he is polishing it with up-to-date field study of such promising air developments as the helicopter. He has returned from two weeks active duty with Marine Helicopter Squadron No. 1 at Quantico, Va.

This group is developing and testing innumerable uses of copters in support and combat. In all, he has flown five copter types, including some experience he ran up on one Marine type last year.

His Marine Corps training, transport and combat time stands at 3,200 hr, in almost 50 types of aircraft, but the colonel is not content to base his CAB decisions and voting on the past. He realizes that a first-hand knowledge of the remarkable helicopter, for example, will be important to him and the industry the Board regulates. Certainly the copter will perform a vigorous role in commercial air transportation within a few years.

This inquiring attitude already has won him praise from the Helicopter Council of the Aircraft Industries Assn. Its chairman, B. L. Whelan, expresses the Council's feelings this way:

"It is most commendatory that a man in Col. Adams' position of responsibility in relation to the aviation industry chooses to determine for himself the basic facts regarding helicopter construction, operation, and performance. The helicopter presents an entirely new facet of air activity. It is related to the airplane only in that it operates in the same medium. In all other respects it is an entirely new vehicle and should not be burdened by the restrictions necessarily imposed on other forms of air transport. After all, when the auto replaced the horse it was not required to carry oats and a feedbag, and the acreage for grazing gave way to a garage for parking. Col. Adams now is in a position to recognize the difference between the horse and the auto."

We hope Col. Adams continues his first-hand briefing tours, and that he will influence his fellow-members to leave their chairs in the Commerce Bldg., and see what makes this great air transport industry tick, and learn what problems keep it from moving ahead faster than its current pace. If he can do this, some of those Board decisions of the future will sound much more realistic.

Reconciling All Views on Jets

It is another bright sign of the Air Line Pilot Assn.'s increasing maturity and foresight that it has polled members on their recommendations for the first American jet transport planes which will be built. As reported elsewhere in today's AVIATION WEEK, these suggestions have been screened by the engineering staff of the union.

Obviously, no commercial plane can be designed, built and operated according to the desires of the pilots alone. And undoubtedly a few of the suggestions will receive a cold reception initially, in some operations, sales and production circles.

Few commercial products being built today represent so many compromises as the airplane, and the jets, with their new restrictions and unsolved problems, will demand unprecedented cooperation of all groups in commercial air transportation.

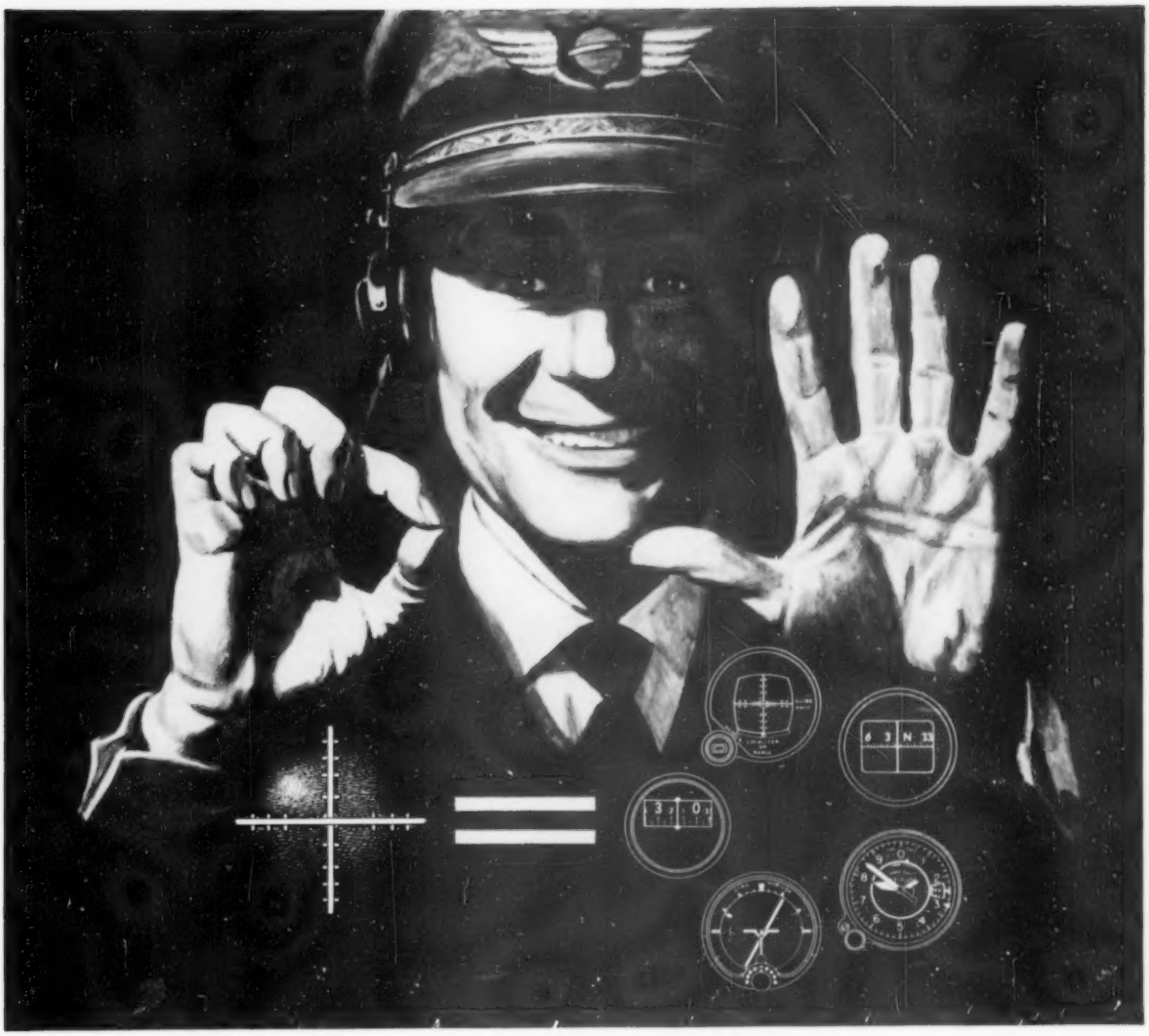
But certainly it is true that the increased precision and importance of the piloting job, and the tremendous cost of each plane, make it mandatory that we give more consideration and thought to the needs and wishes expressed by pilots than we have ever done before in the construction and operation of any other transport types. The recent Chicago sessions of ALPA officials with industry have already set the pace for sincere and harmonious discussions.

We have faith in the fairness of the aircraft industry, the airlines and the flight crews to work out new configurations of airliners that will set records in efficiency, economy and safety for jet equipment.

This crucial designing job seems even more important than the exercise of our vaunted American production knowhow, if we are to beat the British products, overtake their five-to-seven-year lead, and clinch undisputed leadership in this dramatic and important international race.

—Robert H. Wood

NOTE TO EXECUTIVES: Is Aviation Week on your mailing list for releases and announcements? Our address is 330 W. 42nd St., New York 36, N. Y.



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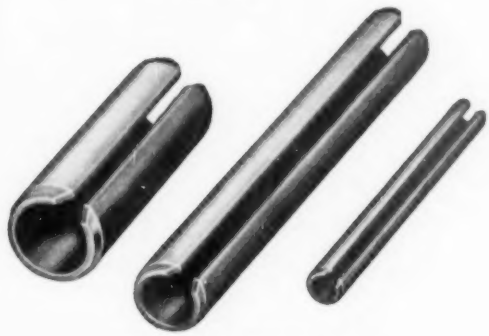

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